The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXV, No. 4 CHICAGO February 25, 1922

EDITORIAL DEPARTMENT—

C. S. Darling, Editor
H. E. Hopkins, Associate Editor

ADVERTISING STAFF—

Chas. A. Breskin,
Advertising Manager

Charles H. Fuller, Eastern Manager,
101 West 41st Street, New York City

A. S. Barnett,
Western Representative

SUBSCRIPTION—Two dollars a year to U. S. and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.,
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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1/3 more per dollar

THE DU PONT COMPANY leads the way in the production of more efficient and more economical explosives. In Dumorite, its latest achievement, it has made possible

a great step in the reduction of explosive costs

Dumorite is a new money-saving dynamite which gives you over 1/3 more work for your dollar—a guncotton-nitroglycerin dynamite without a headache—a non-freezing dynamite which can be used successfully at any temperature.

Dumorite has approximately the same strength as 40% dynamite and does the same work, stick for stick. And you can buy 135 to 140 sticks of Dumorite at the same price as 100 sticks of 40%.

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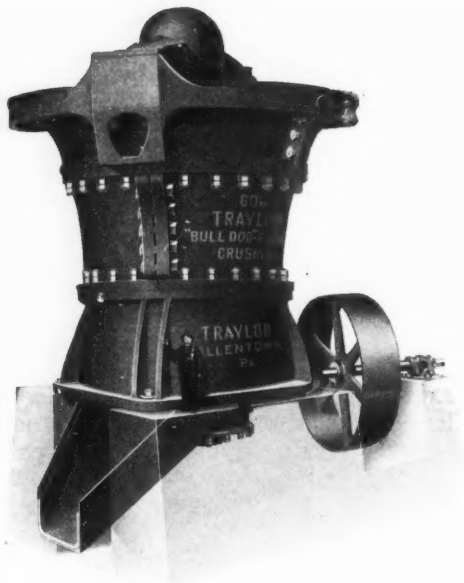
NON-HEADACHE DU PONT **NON-FREEZING**

DUMORITE

TRAYLOR "Bulldog" Crushers

Strong Where Other Crushers Are Weak

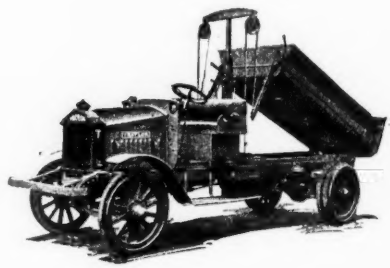


Traylor "Bulldog" Crushers have an established record of practical perfection. The secret of this record is not only to the careful attention we pay to the details of manufacture, but it is in the correctness of design, and the small power consumption, depending upon its remarkably low frictional consuming toggle system.

Above all, the "Bulldog" is the product of men who know the crushing needs of crushing men.

TRAYLOR TRUCKS

Like our crushers, these trucks are made by men who know the needs of the rock products industry. These trucks were designed to stand up and give service day after day. They have given more than ordinary satisfaction to users, in fact we have received several communications that border on the enthusiastic.



Traylor Engineering & Manufacturing Co.

Main Offices and Plant: ALLENTOWN, PA.

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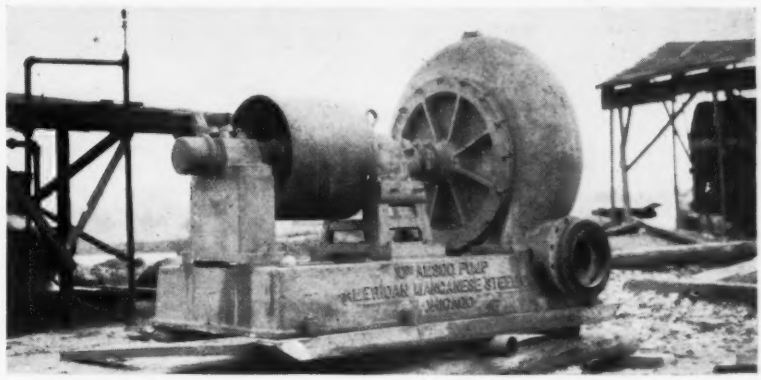


AMSCO MANGANESE STEEL PUMPS

The engravings on this page show an AMSCO Manganese Steel Pump as it was delivered to the Underwood Walker Co., Prattsville Junction, Ala., and the 30-ft. by 60-ft. barge ready for the installation of the pump.

This company formerly operated a drag line, which they have discarded for one of our 10-in. pumps, which is belt connected to a 150-h.p. semi-Deisel engine.

During the past seven months this pump has frequently delivered 50 carloads of sand per day — a concrete demonstration that the AMSCO is a splendid paying investment to producers.

The real source of AMSCO performance, economy and long life, is not alone in the Manganese Steel of which they are constructed, but is due in part to the fact that these pumps are designed and built in the AMSCO Plant.

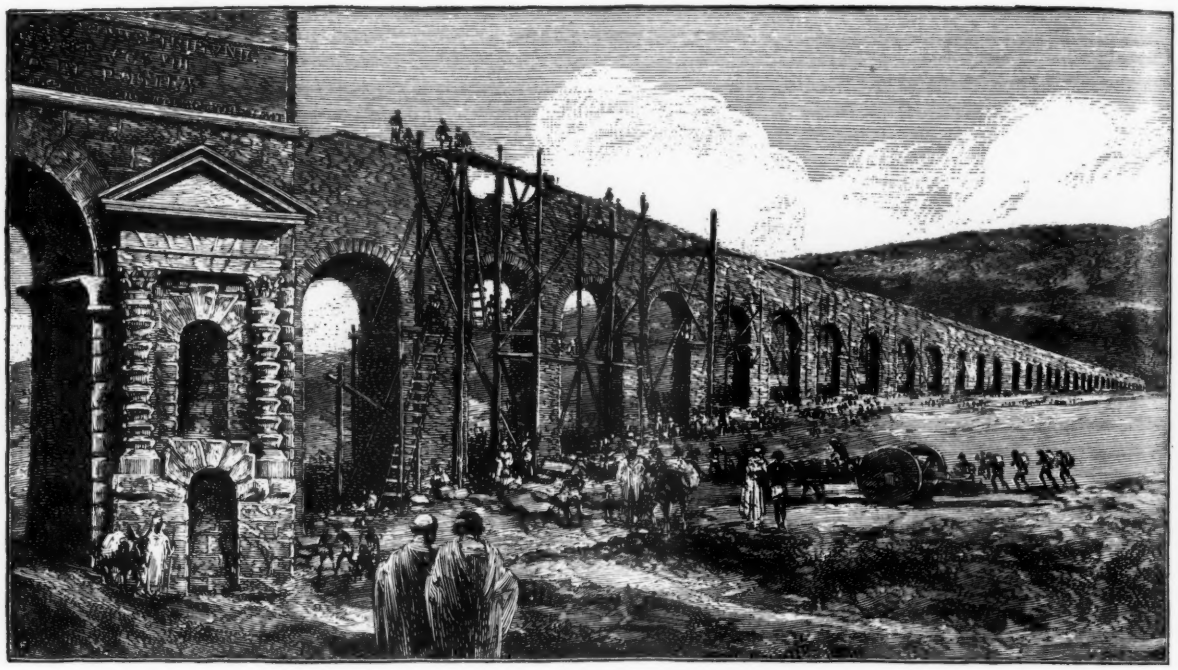
Write for Bulletin No. 100 and let us tell you why the AMSCO is the most desirable pump for your work

We are prepared to furnish rolled and forged Manganese Steel products, and solicit your inquiries.

AMERICAN MANGANESE STEEL COMPANY

General Sales Offices, Chicago Heights, Ill.

Plants: Chicago Heights, Ill. New Castle, Delaware Oakland, California



The Aqueduct of Emperor Claudius

The Romans were undoubtedly the greatest tunnel builders among the ancients.

A tunnel driven through hard rock by Emperor Claudius for his great aqueduct was 19 feet high, 9 feet wide, and over three miles long. More than eleven years elapsed during its construction.

Explosives were unknown. Rock openings were made by chipping and channelling or by cutting large grooves around the block to be excavated. Hand tools of iron, copper and bronze were used, and also wooden wedges as in Egypt. Sometimes fires were kindled at the face and the heated rock suddenly cooled with water, which caused shattering and disintegration.

Slaves and prisoners of war were forced to do this work and it is recorded that they perished by thousands.

Today with the aid of Hercules Explosives, San Francisco is building the Hetch Hetchy aqueduct which will include 69 miles of tunnels. An advance of 776 feet in thirty-one days was made in one heading of the Priest tunnel on this project. At this rate, Claudius' tunnel could be driven by a few men with Hercules Explosives in less than a year.

A lesson on explosives economy is contained in our booklet, "Volume vs. Weight." Write for a copy to our Advertising Department, 951 King Street, Wilmington, Delaware.

HERCULES

POWDER COMPANY

Allentown, Pa.
Birmingham, Ala.
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Duluth, Minn.
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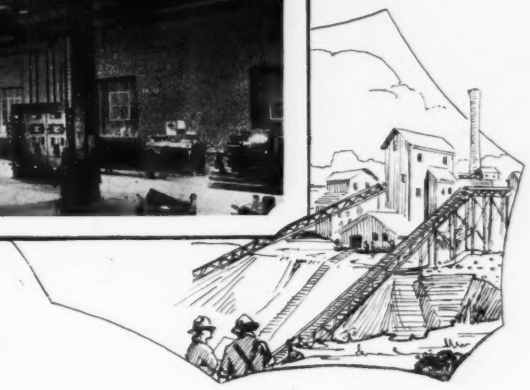
Joplin, Mo.
Los Angeles, Cal.
Louisville, Ky.
New York City
Norristown, Pa.
Pittsburg, Kan.
Pittsburgh, Pa.
Pottsville, Pa.
St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Wilkesbarre, Pa.
Wilmington, Del.

Your New Building

This building is a good example of the kind of design and engineering work which the Federal Bridge & Structural Co. is doing in the rock products industry. Febrisco Steel Products give a clean, strong, well-lighted structure, adapted to your individual needs, economical in first cost, in maintenance and with low depreciation.



There is need in the rock products industry for buildings that are ***engineered*** to each job; not "ready made" buildings but structures specifically designed for quarries, crushed-stone plants, sand and gravel pits, cement plants, lime plants, etc.

"Specifically designed" is the slogan of our service to the rock products industry. Buildings with a minimum of cost, with a maximum of strength, each actually engineered and adapted to the location and needs of your particular plant, is the big point in Federal engineering service. Federal engineers are experienced in the design of all types of buildings needed in the rock products field, from a bin to the biggest crushed-stone plant.

The conveying system, crushing plant, screening plant and loading plant can be built of steel at an economical first cost, can be easily erected and can be salvaged and moved from place to place a great deal better than plants constructed of wood on which the salvage is low and the fire hazard great.

A New Engineering Service

This means a new engineering service. We will bring to ***your*** building problem the advice of engineers of broad experience in your industry. We will supply all the steel and steel sash for the structure. We will give you or your contractor all the plans and specifications needed for the erection of the complete building. All this service ***costs you nothing.***

You cannot afford to miss this opportunity to get the service of the best structural engineers in the country. Write today, giving full details of your proposed buildings, of extensions, the general dimensions you have in mind, the purpose of the buildings and any other data that may be necessary. Without obligation we will then send full particulars of a structure or structures which will adequately meet your needs, render you efficient service and cost the least money.

FEDERAL BRIDGE AND STRUCTURAL COMPANY

STEEL **FEBRISCO** PRODUCTS

GENERAL OFFICE AND WORKS: WAUKESHA, WISCONSIN

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CHICAGO, ILLINOIS MILWAUKEE, WISCONSIN APPLETON, WISCONSIN
WATERLOO, IOWA SIOUX CITY, IOWA
DENVER ENGINEERING WORKS COMPANY DENVER, COLORADO

SHOPE BULLETIN

VOL. I February 25, 1922 Number 13

LEADERSHIP—

Shope leadership has always rested on value.

Shope Bricks is a patented process for making concrete bricks that will earn money for a licensee, giving a monopoly in a territory, together with a product that joins the finest standards with economical production.

Below you will find a list of licensees who are enjoying a tremendous success manufacturing this product. They are going ahead with giant strides, and every one of the firms listed will heartily endorse anything we have said in this series of advertisements.

If you are a producer of sand and gravel, crushed stone or slag, it will pay you to investigate this proposition, and we honestly believe that delays of any sort are dangerous from your financial standpoint. There is but one licensee in a territory, and inquiries are coming in every day. Your territory may soon close.

Investigate now—You will find it profitable

Hasten your inquiry—or your territory may be grabbed off
Write for complete information

Shope Brick Company

361 East Morrison Street Portland, Oregon

LICENSEES:

The Miles Co.—Salem, Ore.
Eugene Concrete Co.—Eugene, Ore.
Wastenburg Brick Co.—Klamath Falls, Ore
Arizona Shope Concrete Brick Co.—Phoenix, Ariz.
Florida Nu-Tex Brick Co.—109 Water St., Tampa, Fla.
Texas Shope Brick Co.—3056 Sumpter Bldg., Dallas, Tex.
Birmingham Slag Co.—Birmingham, Ala.
Shope Brick Co. of Wisconsin—50th and State Sts., Milwaukee, Wis.
The Polychrome Cement Brick & Tile Co.—Carter-Cotton Bldg., Vancouver, B. C.
Dark Canyon Stone Co., H. W. Jones, Mgr., Rapid City, S. D.
Warren Sand & Gravel Co.—Easton, Pa.
Penn Shope Brick Co.—Reading, Pa.
Lycoming Shope Brick Co.—Williamsport, Pa.
Shope Brick Co.—Portland, Ore.
Rustic Brick & Supply Co., Palette Rd., Ford City, Ont., Can.
Puyallup Shope Brick Co.—Puyallup, Wash.
The Shope Brick Co.—Springfield, Mass.
Utah Shope Brick Co., P. O. Box 632, Salt Lake City, Utah
Decoration Brick Co.—1565 N. Lake Ave., Seattle, Wash.

These licensees are all successful manufacturers

For stripping overburden, loading stone or doing any of the other "odd" jobs about the quarry the Model 31 can be fitted with a 35 or 40 ft. crane boom and ¾ or 1 yard bucket, either clamshell or dragline.

As a Steam Shovel

Model 31 carries a 1 cubic yard dipper and can be fitted with 20 ft., 23 ft. or 26 ft. boom.
Model 36 carries a 1¼ cubic yard dipper when equipped with 24 ft. or 28 ft. boom and 1 cubic yard dipper when fitted with 32 ft. boom.

Speaking of Service

This Model 31 started March 12, 1918, and has been in continuous service 10 hours per day, six days a week excavating heavy gravel, wet sand, stone and clay, handling an average of 800 cubic yards per day. The owners—The Morris County Crushed Stone Company, Morris Plains, N. J.—are decidedly well pleased with its performance. So is every Marion owner.

Marion Revolving Shovels are well built, powerful and rugged to an unusual degree. All parts are readily accessible for adjustment and replacement. They have a wide working range and are speedy and easy to operate. This applies particularly to Models 31 and 36.

Flexible Crawler Trucks—the Real "Caterpillar" Type Trucks for Steam Shovels—can only be secured on Marion Shovels. On Models 31 and 36 these trucks are especially adapted to service in the quarry or gravel pit. Let us describe their construction in more detail. A request from you will bring complete information.

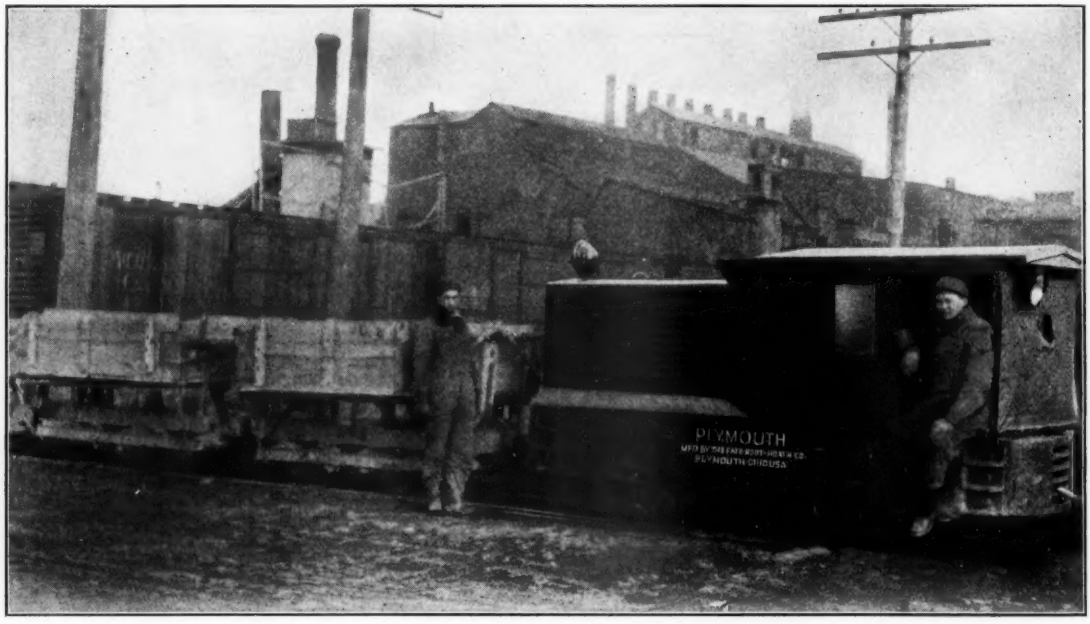
THE **Marion** STEAM SHOVEL CO.
Marion, Ohio

EVERYWHERE RELIABLE — THE Marion STEAM SHOVEL CO. — ESTABLISHED 1884

New York **Chicago** **Atlanta** **San Francisco**

Boise, Idaho—Clyde Equipment Co.
Billings, Mont.—Connelly Machinery Co.
Dallas—F. B. Wright, Bush Bldg.
Denver—H. W. Moore & Co.
Detroit—W. H. Anderson T. & S. Co.
New Orleans—C. H. Stem, 518 Conti St.
Vancouver—Vancouver Machinery Depot, Ltd.
Montreal, Toronto—F. H. Hopkins & Co., Ltd.
Philadelphia—H. L. Cox, 13th and Market
Pittsburgh—J. W. Patterson
Portland—Clyde Equipment Co.
Salt Lake City—H. W. Moore & Co.
Seattle—Clyde Equipment Co.
Spokane—Clyde Equipment Co.

Glad They Installed a Plymouth Locomotive



This stately six-ton PLYMOUTH Gasoline Locomotive has just arrived at the plant of the Peerless Portland Cement Co., Union City, Mich., with ten heavily loaded cars.

This Company experienced more or less trouble with the transportation of materials from quarry to incline. Teams were found inadequate. Trucks were too slow and without sufficient capacity.

Finally track was laid and the job was turned over to one sturdy six-ton PLYMOUTH Locomotive. Now Manager W. M. Hatch says:

"We are pleased to say that the six-ton PLYMOUTH Gasoline Locomotive, which we bought of you, is giving good satisfaction. It has effected a considerable saving in our haulage and we are very glad we made the installation."

The Fate-Root-Heath Company **Plymouth, Ohio**

PLYMOUTH
Gasoline Locomotives

Rock Products

Volume XXV | Chicago, February 25, 1922 | Number 3

Gravel Plant with Unusual Ground Storage System

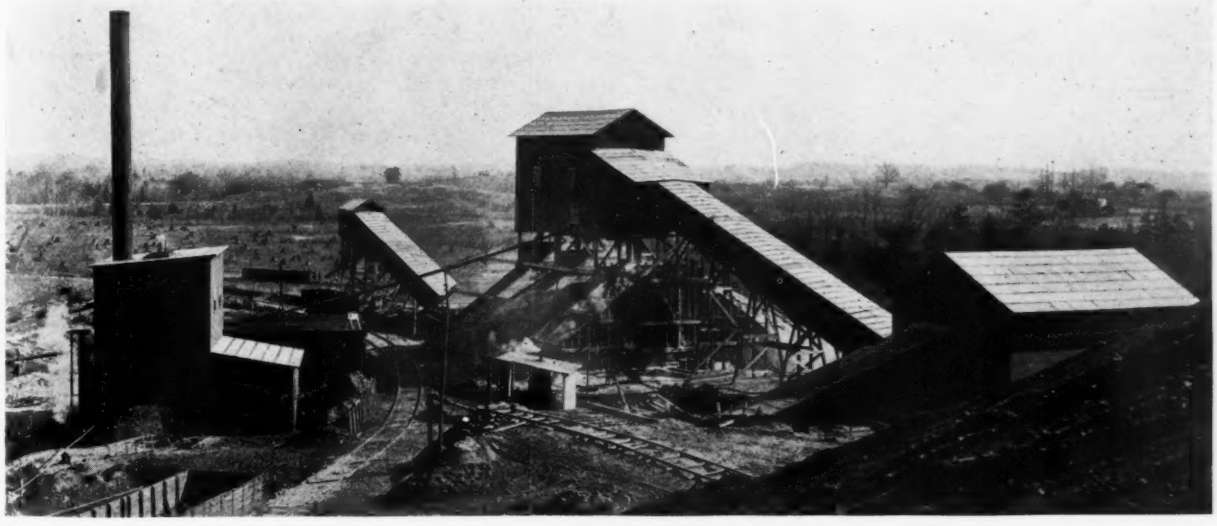
Midland Gravel Company, Midland, Michigan, Maintains Large Storage Without Maintaining Expensive Bins

By Frank M. Welch
Chief Engineer, Greenville Gravel Co.
Greenville, Ohio

ON the Pere Marquette railroad, between Milbrook and Remis, Mich., is the plant of the Midland Gravel Co. This plant is not only modern and efficient in every respect, but it is rather unusual in that it employs ground instead of bin storage, thereby securing a large storage capacity without the cost of maintaining expensive bins.

Excavating Machinery

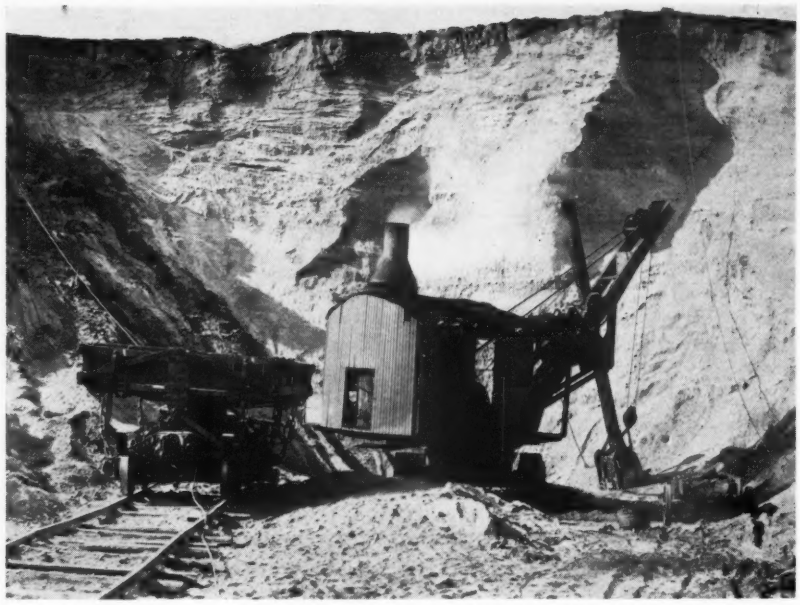
All of the material is excavated by a traction steam shovel and conveyed to a concrete receiving hopper by Western side-dump cars and a locomotive. Over the top of the receiving hopper is a grizzly made up of steel railroad rails, which eliminates all boulders too large for their primary crusher to handle. Underneath the outlet gate at the bottom of the hopper, a rotary feeder controls and insures uniform flow of material to a 24-in. belt conveyor at 89 ft. centers. The feeder is driven from the tail shaft of the belt conveyor. A sliding gate between the hopper opening and the feeder also assists in regulating the flow of material; it does not require the constant attention of an operator. This gate opening is changed only when the steam shovel is operating in an extremely coarse or fine section of the pit.



View of entire plant of Midland Gravel Co. from top of bank

The belt conveyor elevates the sand and gravel to the top of a crushing plant, where it is discharged into a revolving, double-jacketed scalping screen 48 in. in diameter by 11 ft. 6 in. long. The inner jacket of the scalping screen contains 3-in. round perforations and the outer jacket 1¼-in. round perforations. All material rejected by the inner jacket passes directly to a No. 4 Gates gyratory crusher; all passing the outer jacket goes to a 36-in. Symons disc crusher. The crushed gravel from both crushers passes to a 20x9-in. continuous bucket elevator, which lifts it to the top of the plant and discharges it again into the scalping screen. All material, including sand, fine and crushed gravel, passing through the outer jacket of the scalping screen is spouted direct to another 24-in. belt conveyor at 155 ft. centers.

This conveyor carries the material to the top of the screening and washing plant, where it is discharged directly into a three-jacketed revolving screen, 48 in. in diameter by 18 ft. long. The inner jacket of this screen contains ¾-in. round

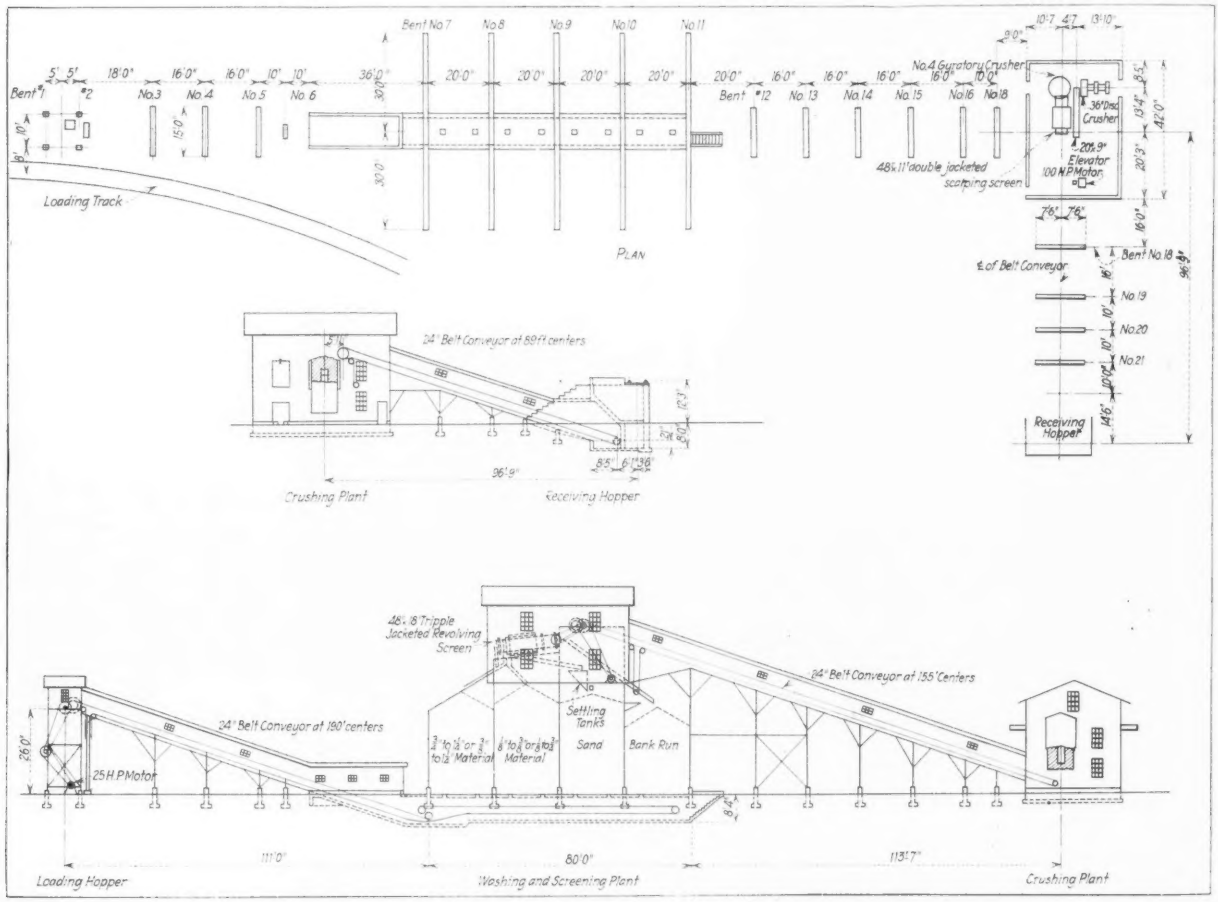


Steam shovel in sand and gravel pit

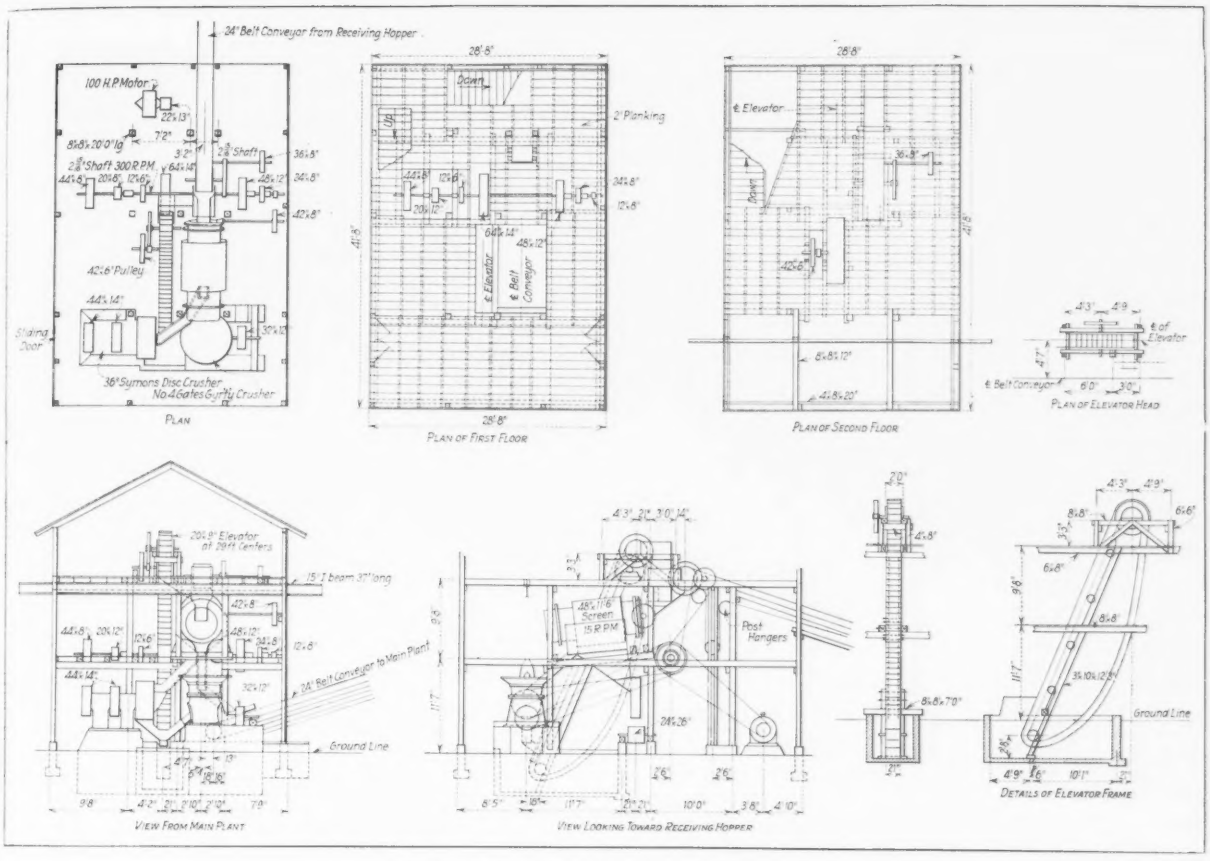
perforations, the middle jacket 3/8-in. round perforations and the outer jacket 1/8-in. slots. The receiving end of the screen consists of a scrubber 48 in. in diameter by 6 ft. long containing baffles for thoroughly washing the material before it enters the perforated sections. This screen as well as the scalping screen are supported on 33-in. diameter single-flanged cast-steel trunnion wheels, mounted on 3 7-16-in. cold-rolled shafting and adjustable bearings. The trunnion rings are of cast iron with heavy steel tires shrunk on. The screen is driven through cast steel gears and the thrust is borne by a bronze bushed, chilled thrust roller 12-in. in diameter by 3-in. face bearing against one trunnion ring.

Gathering Hopper

A steel gathering hopper fitted with partitions and fly-valves is located under the discharge end of the various jackets of the washing screen, which receives the various grades of gravel and diverts, mixes and proportions them to the particular storage pile desired. A steel sand hopper underneath the outer jacket passes the sand through a bifurcated sluiceway to two 6x6-ft. steel automatic sand-settling tanks. These tanks separate the clean sand from the dirt-laden water, discharging the sand to its ground storage pile and the water through a long sluice-



General layout of the Midland Gravel Co. plant at Midland, Mich.


24" Belt Conveyor from Receiving Hopper
100 H.P. Motor
36" Symons Disc Crusher
No. 4 Gates Gyratory Crusher
Plan
Plan of First Floor
Plan of Second Floor
Plan of Elevator Head
24" Belt Conveyor to Main Plant
Ground Line
View From Main Plant
View Looking Toward Receiving Hopper
Details of Elevator Frame

Details of the plant of the Midland Gravel Co.

way to a low place some distance away on the property.

The bulk of the washing water enters the scrubber with the material through the conveyor discharge spout. This dirty water immediately passes through to the settling tanks upon entering the screening section, after which all material is rewashed and rinsed by means of a spray pipe which passes through the entire length of the screen and sprays the material with clean water.

Separating Material

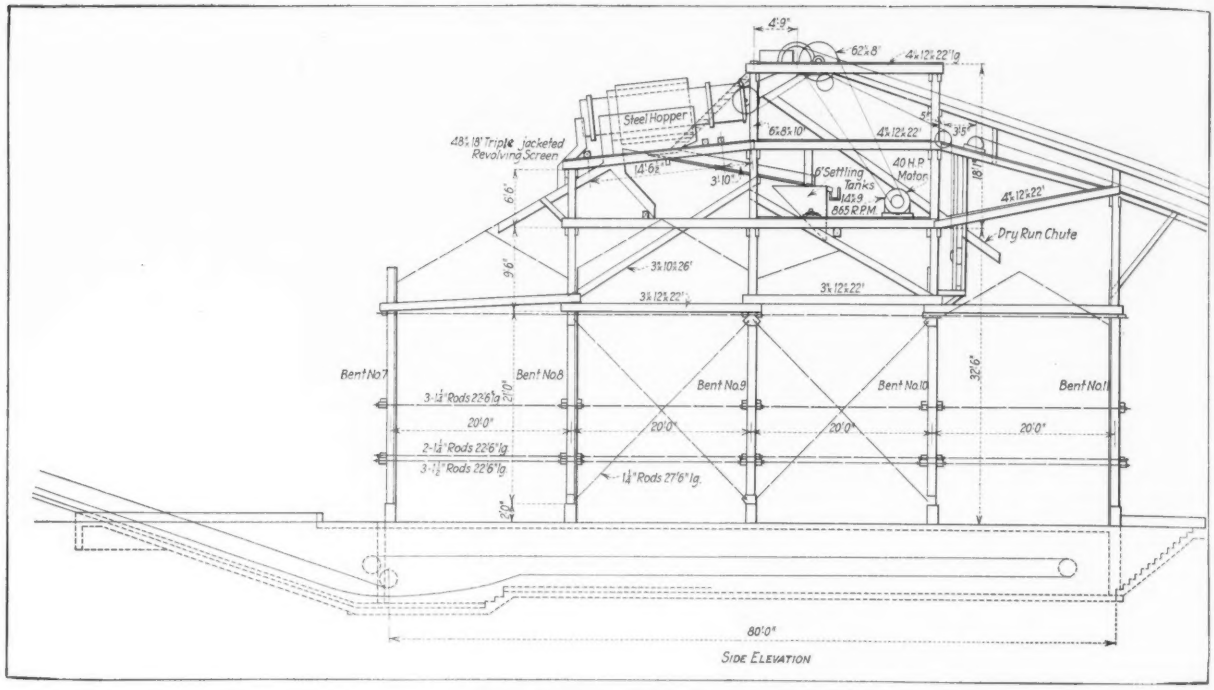
Various grades of material in the ground storage underneath the washing plant are separated by triangular partitions, shown in the accompanying illustrations. Underneath and throughout the entire length of the ground storage extends a concrete tunnel containing gates in the roof at 10-ft. intervals. These gates, operated by hand levers, discharge the grades of sand and gravel, through feed spouts, to a third 24-in. belt conveyor at 190 ft. centers.

This conveyor, known as the loading conveyor, extends the length of the tunnel. After passing the end of the storage, the conveyor curves upward and discharges commercial sand and gravel into a small loading bin, from which all cars are loaded for shipment. This loading bin is not intended for storage purposes, although it is large enough to permit closing the car loading gate while shifting cars without stopping the loading belt.

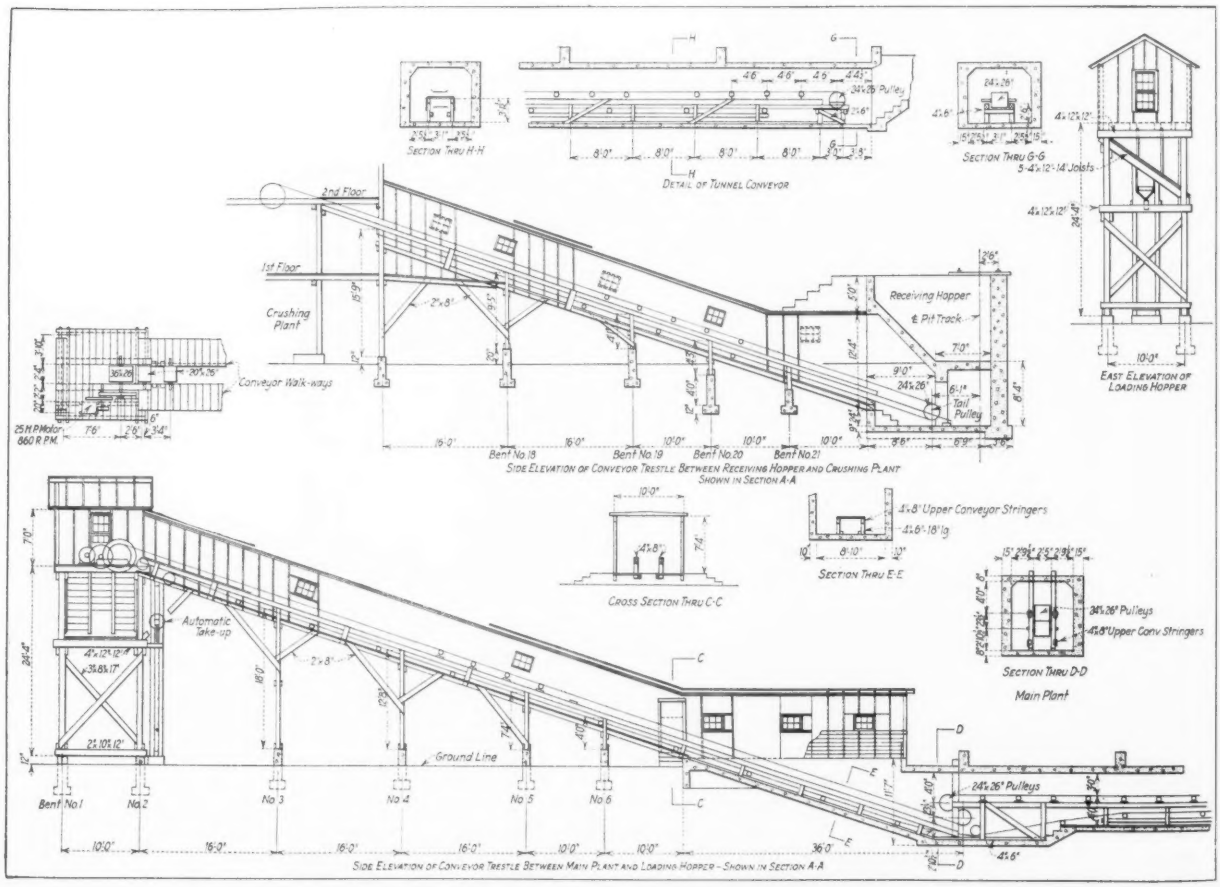
The entire plant is electrically driven from the company's own power plant, which also furnishes electric lighting throughout the tunnel underneath the storage pile, and also lights the entire plant for night shifts.

Exterior of crushing plant

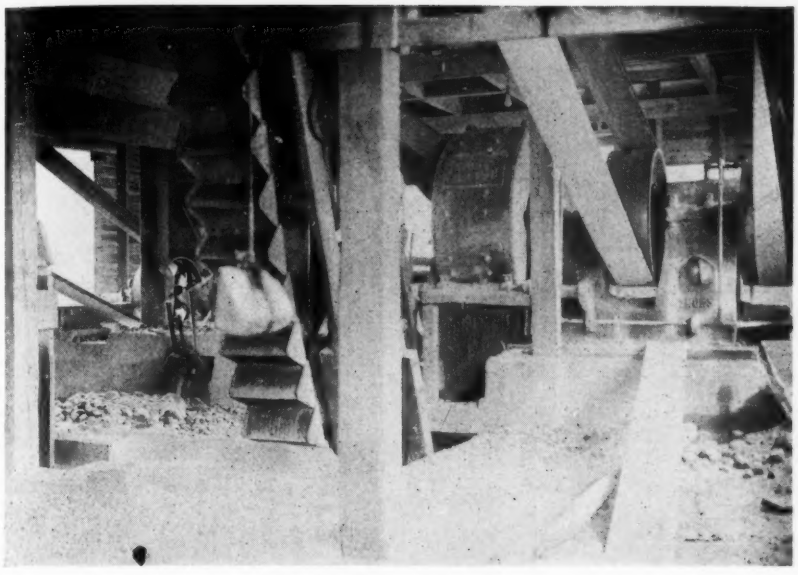
The whole operation was engineered and designed by the consulting engineering department of the Greenville Gravel Co., Greenville, Ohio. The screens, sand settling tanks and other machinery were



Showing the side elevation of the main washing plant



Conveyor trestle between main plant and loading hopper



Interior of crushing plant

built and furnished by the Greenville Manufacturing company, which is the maintenance department of the Greenville Gravel Co.

William H. Allswede, of Hersey, Mich., is president of the company, C. G. Olmsted, secretary and treasurer, and Albert Reed, general manager.

Varied Uses of Silica

SILICA, one of the most widely distributed constituents, has a remarkable variety of uses, states the United States Bureau of Mines. In its various forms, as quartz, quartzite, sandstone, flint, tripoli, diatomaceous earth, sand and gravel, etc., silica finds its way into house construction, glass products, etc.

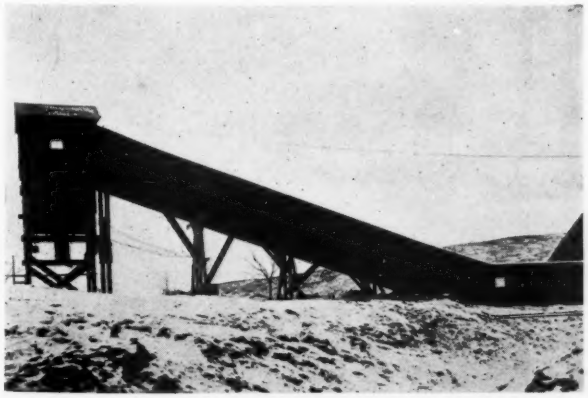
Silicon dioxide occurs in a free state chiefly as quartz, but hydrous silica occurs as opal, flint, diatomaceous earth, tripoli, etc. Quartz is found in many forms, the most important of which are vein quartz, quartzite, sandstone, silica sand and gravel, crystals or crystalline grains, masses or aggregates in igneous rocks such as granites, diorites and pegmatites.

Free silica is very widely distributed, but deposits of commercial value are far less common. Most forms of silica are sold for such low prices that economic factors, such as proximity to railroads and to local markets, govern the value of a deposit. Thus deposits of glass sand may be valueless if located far from supplies of cheap fuel and far from large centers of consumption for glass.

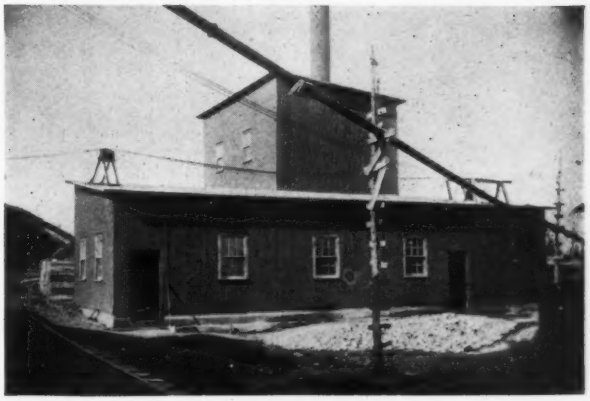
Methods of mining the various siliceous materials vary widely, dependent on the form of the material, nature and location of deposits, and type of product to be made, the Bureau of Mines found. Most of the deposits are worked by open-pit or quarrying methods, often in a very crude way. Sand deposits may be worked by hydraulicking, by dredging or by the use of a steam shovel. Vein quartz is often obtained as a by-product in the mining of other materials.

Main washing and screening plant from the side

Showing ground storage partitions



Conveyor and hopper by which all cars are loaded

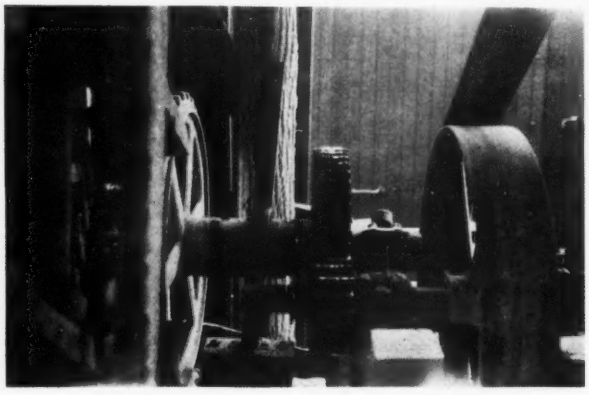


Exterior of the power plant

Hints and Helps for Superintendents

Reversible Belt Conveyor

A BELT conveyor which operates underneath a Bates valve-bag packer and which can be reversed so as to deliver bags to storage or to cars is one of the features of the newly constructed Tennessee-Illinois Co. phosphate plant at Twomey, Tenn. The belt conveyor is 30 in. wide, 36 ft. between centers, and so situated under the valve bag packer that as soon as a bag of material is filled it is dropped on the belt conveyor and delivered either to storage or to cars for loading. This reversal of motion is accomplished by a double square jaw clutch, as shown in one of the illustrations.



Jaw clutch showing belt and sprocket-wheel drive

When it is necessary to have the conveyor deliver to cars the jaw clutch is shifted so as to engage the gearing, the pinion of which is driven from a pulley, belt-connected to the shafting overhead. As the filled bag goes over the head pulley it goes into a metal chute and is delivered direct to the car. The chute is hinged and can be put out of the way when not loading. On the other hand, if it is desired to send the bags to storage the clutch is shifted to engage a sprocket wheel, chain driven from shafting above. This installation affords great flexibility in operation.

Cable Strength in Anchor

WITHOUT sacrificing any of its strength, a method of fastening 2¾-in. cable to an anchorage was employed on cableways used in the construction of the Kern Canyon plant of the San Joaquin Light & Power Corp., near Bakersfield, Calif. When the concrete anchorage was being cast, there was imbedded in it a 4-in. pipe bent in the form of a loop with both ends projecting on top of the anchorage, the minimum radius being about 2 ft. When the concrete had hardened the end of the cable to be anchored was welded to the end of a ½-in. cable which was passed through the pipe and used to pull the main cable through. The end of the cable was then made fast by five Crosby clamps 30 in. apart with clips in between. The pipe was filled with grease before the main cable was pulled through. This made it easy to get the cable in and out, and meantime, with the aid of waste stuffed in the ends of the pipe, prevented rusting. After completing the work the cable was easily removed and its entire length salvaged.

Hinged chute from head pulley of bagging belt conveyor leading to car

"Let Your Light So Shine"

THE method pursued by Jahncke Service, New Orleans, La., in advertising its products is shown in the accompanying illustration. The bunker shown is in direct view of all trains entering the union station and of the boats on the Basin Canal. Such methods have made the name "Jahncke" a familiar word all over New Orleans and it impresses itself on transients entering and leaving New Orleans. Such letters can be made of sheet metal, given a coat of white paint and nailed on the bunker. The rest follows of its own accord.

One of the many ways the Jahncke Service takes to advertise its business

Safety Device for Hoisting

ONE of the simplest ways to prevent overwinding in hoisting is to use beveled guides just below the sheave wheel. If the ordinary guides are 4x6 in., the safety guide is made from a 6x8-in. timber. The lower end of the guide is framed 4x6 in. and connected with the standard guide. The guide is then gradually tapered to 6x8 in. at the upper end. Two of these guides of equal length are put in. The 6x8-in. end is just below the sheave wheel. The length of the beveled guide depends upon the head room available above the cage.

In case of overwinding, either of two things usually happens. The cage is generally drawn up into the sheave wheel with such violence that the wheel is often broken, but sometimes, if the speed is sufficiently great when the cage strikes the sheave wheel, the rope is broken, and if the safety dogs refuse to hold the cage it drops back into the shaft.

Loading holes at the Trumbower quarry

When safety guides are used it is practically impossible to draw the cage up into the sheave wheel, and if the rope should break, the cage is held so tightly in these guides that it cannot fall back into the shaft. These guides hold the cage in two ways; they spread the shoes and they bind against the cage. The pressure exerted against the hoist is sufficiently great to bring it to a stop.

Such safety guides have been used for many years in the Southwest, most extensively at Canada, and are very satisfactory. It has been found when there has been an overwind that the cage is caught so tightly in them that it is quite a job to get it out.

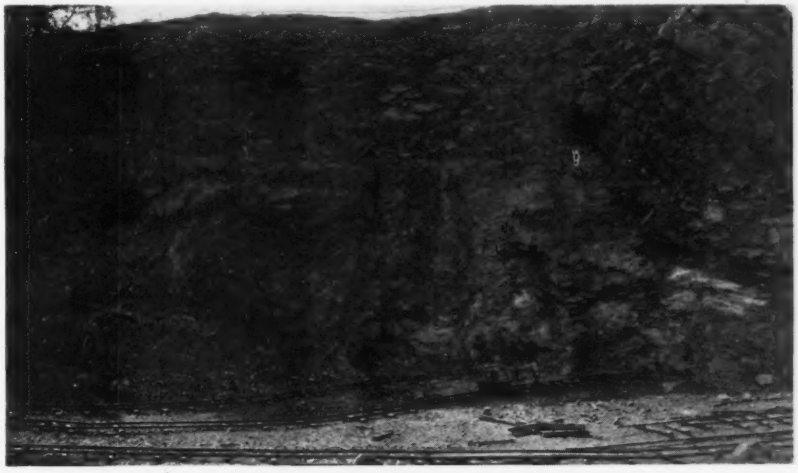
This overwinding device is simple, efficient, inexpensive and when properly installed requires no care or watching. It is not as satisfactory for high-speed, high-powered hoists as for the more common type. Its use is not nearly as general as it should be. Where used it has given great satisfaction. The hoisting engineer always knows that the beveled guides are going to stop the advance of the cage into the sheave wheel. The worst that can happen is for him to run the cage up into the guides and get it stuck there, but he need have no fear of being the cause of a serious or fatal accident from overwinding if these guides are properly installed.—*Engineering and Mining Journal.*

Cost Data on Quarry Blasting

AT the quarry of the Trumbower Co., Nazareth, Pa., the following detailed cost data were obtained at the time the blast shown in the accompanying illustrations was made.

For this blast Hercules low-freezing extra dynamite was used and the electric blasting caps were connected in parallel. The holes were drilled with well drills. At 9 o'clock in the morning the loading began and at 4:30 o'clock in the afternoon the blast was fired.

It can be seen, as shown in one of the illustrations, that, due to the dip of the rock strata, loading the holes was not an easy task, therefore considerable care was needed in order to get the explosive to the bottom of the holes. Here are the cost data:



The quarry before the blast

Results of the blast made with dynamite

FIGURES COVERING BLAST AT TRUMBOWER CO. QUARRY

Hole	From face	Between Holes	Depth	Blasted, cu. yd.
1	12′	14′	50′	311
2	12′	14′	60′	373
3	12′	14′	65′	510
4	12′	14′	65′	510
5	12′	14′	70′	558
6	12′	14′	70′	558
			Total (7050 tons)	2820

Cost of powder, low-freezing extra—		
900 lb. 60 per cent at $19.25	$173.25	
1500 lb. 40 per cent at 16.75	251.25	
609 lb. 30 per cent at 15.75	94.50	
3000		$519.00
Drilling, 380 ft. at $1.25 per ft.		475.00
Blasting supplies—		
Three No. 6 40 ft. caps	$0.82	
Six No. 6 80 ft. caps	3.03	
		3.85
Connecting wire		1.48
Total		$999.33

Estimated tonnage—7050.

Cost per ton (including drilling and blasting)—$0.1417.

Fountain Sand and Gravel Co. Operations

Employs Electric Power and Automatic Machinery—This Plant Withstood the Pueblo Flood of Last Summer Without Serious Damage

FOUNTAIN river, from which the Fountain Sand and Gravel Co. of Pueblo, Colo., takes its name, was one of the streams which caused so much damage to the industries along its banks on June 4, 1921, as well as wrecking five bridges which connected Pueblo with the east side. During the night of June 3 the water came with such rapidity that in 3 hr. it had widened the 300-ft. channel to approximately 500 ft. Fortunately, however, the damage on the Fountain river banks did not prove so severe as that caused by the Arkansas river, which runs through the center of the business district of Pueblo.

Showing the destruction done to the bridge across the Fountain river. The company's hoist house is indicated by the arrow. Photo taken from an aeroplane

As can be seen in the above illustration —taken from an aeroplane picture made less than 10 days after the Pueblo disaster—the upper bridge at Fourth street lost its southern span, which swept down and pierced the railway bridge shown at the left. The arrow marks the site of the Fountain Sand and Gravel Co.'s hoist house, which during the flood stood up without severe damage, although the river washed the bank away even with the bins.

The capacity of the Fountain plant is now 300 yd. per day, but it has been so designed that this capacity can be increased to 500 yd. whenever it becomes necessary. During the past year the river flow has been sufficient to replace all of the sand that had been excavated by the Sauerman dragline cableway excavator. The former 500-ft. span has been increased to 600 ft. since the flood. In case it becomes necessary to stop cableway operation for repair work, the hopper, holding 20 yd. of sand, provides ample surplus material with which to continue plant operation. One of the illustrations shows the hopper and the chutes feeding a 2-in. screen.

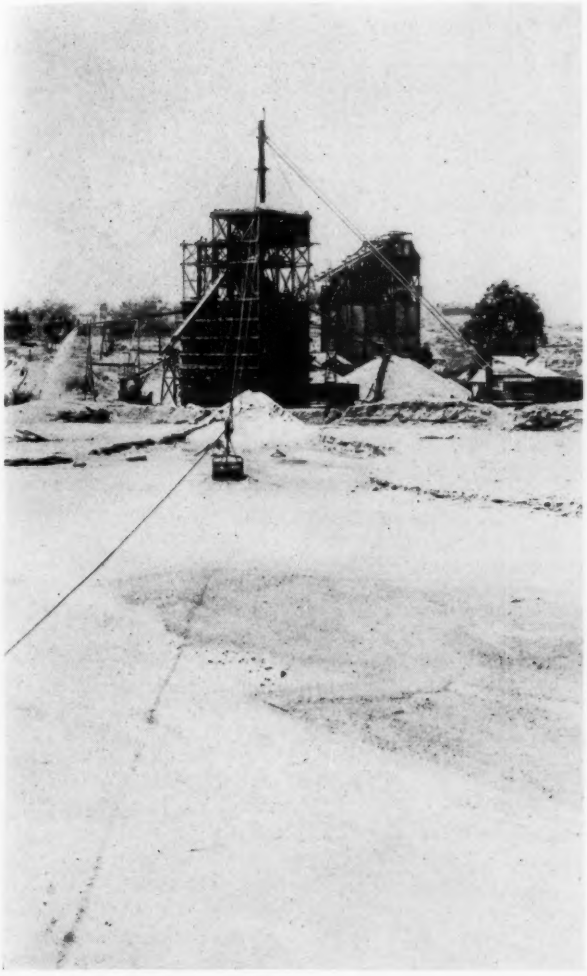
After the material has passed through the screen it goes to the top of a Mitchell vibrating screen, also shown in an illustration, the wire mesh having a ⅜-in opening, the material rejected being passed on to the gravel bin. The material which passes the screen goes to the dewatering box and thence to the concrete sand bin.

A set of Mitchell vibrating screens is utilized for screening plaster or engine sand, the opening in the wire cloth being about ⅛ in.

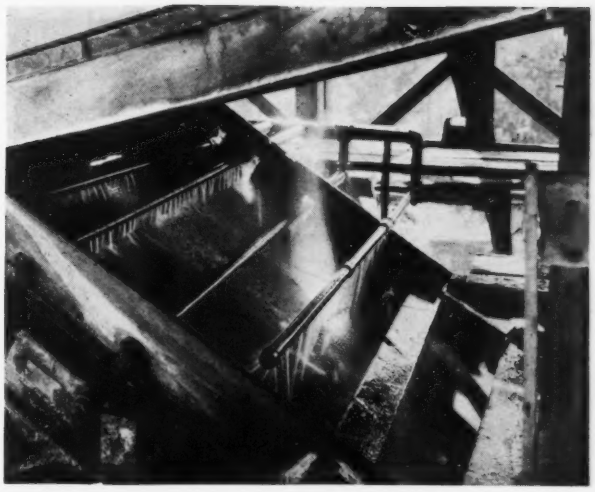
When running, the automatic dewatering wheels require no attention. The company acknowledges its indebtedness to the mining industry for this very successful application. No matter how dirty the sand is, these wheels keep on churning until the sand is cleaned, and then it is elevated over the side of the box.

Still another illustration shows the bins and the loading spout on the track side of the bins. On the other side are chutes for loading the motor trucks. All cars are stored above the bins and when needed are spotted by gravity to the loading chutes.

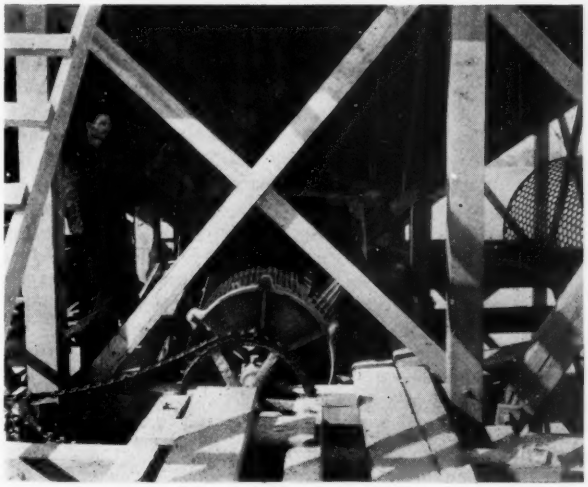
The entire plant is operated by electric power and automatic machinery is em-



The deposit of the Fountain Sand and Gravel Co. on the banks of the Fountain river, Pueblo, Colo.

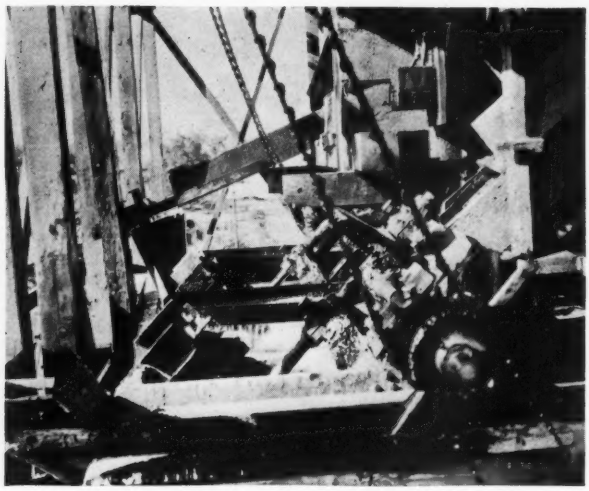


Material passing through to Mitchell vibrating screen, utilized for screening plaster and engine sand

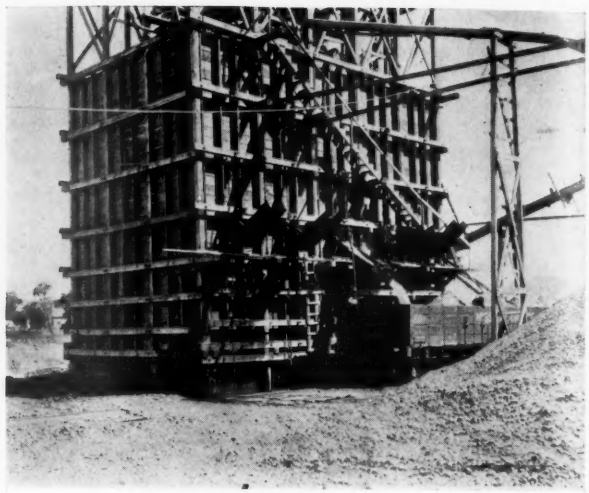


Hopper and chute feeding into 2-in. screen. The hopper has a capacity of 20 yd.

Dragline cableway excavator dumping into automatic hopper. The span is 600 ft.



Automatic dewatering wheels



Bins and loading spout

ployed wherever it is found feasible. In ordinary times, three men are employed. The engineer excavates the sand in the river and then elevates it to the bin tops. Here one man has charge of the feeding sand and looks after the screening process. The third man cleans and loads the cars while the plant is in operation.

This plant operates through the winter season unless the temperature reaches down to 28 deg. The smallest output in any month of 1921 was more than 50 cars.

C. S. Glascoe is president of the Fountain Sand and Gravel Co. and J. A. Bullen is the manager.

Decline in 1921 for the Lime Output

ABOUT 2,531,000 short tons of lime, valued at $24,536,000, were sold in the United States, including Hawaii and Porto Rico, in 1921, according to an estimate made by the United States Geological Survey, from reports made by the principal producers. This quantity is less than that sold in any year since the Survey has collected its statistics and is 29 per cent less than that sold in 1920. The five states that increased their output in 1921 made only small gains and were affected by local or special conditions, such as contracts made late in 1920.

The sales of hydrated lime were estimated at 737,000 short tons, a decrease of less than 14 per cent as compared with those in 1920, whereas the sales of quicklime (including refractory lime or dead burned dolomite) were estimated at 34 per cent less than in 1920. Of the 30 states that reported an output of hydrated lime in 1921 only seven showed an increase in production.

Though a few producers reported that the demand for construction lime was equal to or greater than in 1920, by far the larger number reported a much smaller demand and a decrease of output of 20 to 75 per cent. The total output of construction lime undoubtedly decreased in 1921, but that of chemical lime and agricultural lime decreased as much, if not more. The output of Pennsylvania decreased nearly 40 per cent.

Tom Sullivan Visits the Old Sod

THERE'S slashin's of stone men who know Tom Sullivan, general manager of the National Stone Co. of Omaha,

Thomas "Omaha" Sullivan

Neb., but not all of them know that he is now on his way to his old home in Ireland. He told us the news when he stopped off here in Chicago and shook us by the hand.

Tom has combined Ireland's motto with Uncle Sam's—"Erin go unum e pluribus bragh"—and now he's sailing the briny to tell his old pals what a bully combination it is.

He also told us how he nearly lost a good friend, to whom in a small game he dealt a poor hand. "I'm betting you've a spade hand," says Tom. "An' how d'ye know it?" asks the other fella. "I saw you spit on your hands," says Tom. But they parted the best of friends.

The "Omaha" under the picture is added to Tom's name in honor of the clan O'Maha, which early settled in Omaha and may have given the city its name.

Cheaper Rates for Agricultural Limestone

REDUCTIONS in freight rates on agricultural limestone have been secured for New York farmers through the New York Farm Bureau federation in co-operation with the State Bureau of Traffic and Transportation and the New York State College. The lower rates became effective on January 23 and apply to carload lots. Some of the tariffs which are out apply to hauls of 120 miles or more. Within a short time additional tariffs will be released on the short hauls.

Rates on one stone product will go down on March 1 in the Central Freight Association territory. A. P. Sandles, secretary of the National Agricultural Limestone Association, reports the following extract from a letter from the Big Four Lines:

"Lines in Central Freight Association territory recently approved the application of crushed stone screenings rate on agricultural limestone not ground or pulverized when shipped in open top cars, which basis is to apply throughout Central Freight Association territory, effective March 1, 1922."

The Removal of Clay from Sand and Rock

No. 2—Method of Washing—How Certain Conditions Determine the Amount of Water Which Is to Be Used in Removing Clay

By Edmund Shaw
Allen Cone Co., El Paso, Texas

IN the first of this series, dry methods of clay removal were considered, and it was explained that these are only partial or preliminary methods, except in the case of "dusting off," which is still in the experimental stage. To finish the work and thoroughly remove the clay, washing with water is the method universally adopted.

Washing is simple enough in principle. All that is necessary is to mix the clay and sand with sufficient water to take the clay into suspension, and then allow the sand to settle out and fall to the bottom of some sort of container. The water above the settled sand is then drawn off, carrying with it the greater part of the clay, leaving the sand comparatively free from clay. If the sand is not clean enough after one washing, the process is repeated until the required cleanliness is obtained.

Settling Out the Sand

But although the process is simple, it has features which it will pay to study. At the outset of this study it will be seen that the whole process depends upon a difference in the settling rates of sand and clay. Both sand and clay settle in water, but clay settles slowly while sand settles rapidly. The finest grains of sand saved in washing concrete sand have a settling rate 15 to 20 times as fast as that of ordinary clay. But when one comes to washing very fine sands the difference in settling rate between the sand and the clay is much less, and it becomes difficult, or impossible, to get a clean sand with a single settling.

Hence, the size of the container in which the sands are settled out is very important. It must be big enough to settle out the finest sand that it is desirable to save, and yet it must not be so big that it will settle the clay. The stream of water in almost every case flows through the container, the sand settling out of the current and the water with the clay in suspension overflowing all of the time. Therefore, the size of the container is determined not by the amount of sand to be settled or by the clay to be overflowed, but by the water which is used. The question of the proper size of container (tank, bin, settling box or classifier) will therefore be left until the amount of water that must be used has been considered.

Washing takes considerable water to do good work. But, first of all, it is a process which must be economically applied, if the work is on a large scale. As pumping costs money, no more water should be used than is necessary, unless, as shall presently be seen, the amount of water is determined by the conditions of mining.

Water Used in Mining the Crude Material

We shall find all the way through that we can never separate the washing process from the mining method. In the first of this series it was shown how the washing was improved by selective mining and the sorting out of clay lumps. But the mining method itself has a much greater influence on the design and operation of the washing plant, as, in the majority of cases, those are determined by the mining method adopted.

For the consideration of their influence on the washing process, the mining methods may be divided into three classes, say, dry digging, hydraulicking and suction-dredging. In dry digging all the water needed for washing must be sent to the plant, where it first meets the crude material. In hydraulicking, the water used is usually sufficient for the work of washing, but sometimes more water has to be added at the plant. In suction-dredging it is usual to find that more water is used in mining than is really needed for washing, and the plant has to be designed to accommodate large volumes of water. In point of tonnage, dredging is probably the method most used for mining materials which have to be washed.

Solids in Suction Dredge Discharge

As has been noted, the amount of water taken by the pump of a suction dredge is large in proportion to the solids. This is due both to the way the sand and water enter the suction and to the fact that it is the practice to use as large pumps as possible in order that the suction and pipe line may not become stopped too often by large pieces. The percentage of solids in the pump discharge varies greatly. At the start nothing but water comes, but when the solids begin they soon increase to the regular percentage maintained in pumping. At times, when soft and loose material is encountered, the solids rise much higher than the regular percentage.

In connection with his regular work, the writer has visited a number of plants in which suction dredges were employed, and he has made inquiry into the usual percentage of solids in the discharge. His notes show average percentages around 10 per cent of solids. Figures based on the daily tonnage of sand and gravel produced and the gallons per minute of water pumped are likely to be inaccurate. They are usually obtained by dividing the daily tonnage by the number of minutes in the day, without regard to shut-downs.

A not unusual method of stating the amount of water used in a plant is the gallons per minute used per yard of material produced. Stated in this way, the dredge sends 7 to 8 gal. per minute of water to the plant for each yard of material produced daily, which, as we shall see presently, is a higher ratio than we find with other mining methods, except in the case of very clayey deposits.

Water Used in Hydraulic Mining

Water is used in hydraulic mining to cut the material from the bank, and in many cases it is necessary to add more water to dilute the pulp sufficiently to be pumped to the washing plant. In such cases the water added is usually sufficient for washing, no addition being made at the plant except in those cases where rinsing or a second washing is necessary.

Possibly the largest use of hydraulic mining in this country is in the pebble phosphate fields of Florida, where the method has been very highly developed. In this field the writer's observation is that sufficient water is used in hydraulicking to do all the washing. But in a silica-sand plant in Oklahoma and in a building-sand plant in Ohio, using hydraulic mining, very considerable amounts of water had to be added before pumping to the plant. At the Ohio sand plant the solids were 30 per cent of the pump discharge, but this figure is higher than that usually found in plants of this kind.

Character of the Deposits

We have seen that washing is influ-

enced by the mining method to a great extent, but the character of the deposit to be mined has an even greater influence. Here is encountered one of the first principles of washing: *The finer the grains of the material, the more water must be used.* A moment's reflection will show that what would be sufficient water to wash a coating of clay from large gravel stones might not be enough to fill the voids in an equal volume of fine sand. The surface exposed is much greater in cubic feet of sand than in cubic feet of gravel, and we will see in a later article how much the washing process is affected by this fact.

We may recognize three different types of deposits, so far as washing the material is concerned. These are graveling deposits, in which gravel predominates; sandy deposits, in which sand predominates, and clayey deposits, which contain an unusually large amount of clay.

These terms apply to all the materials which are mined and washed and not alone to the deposits which are mined and sold as gravel and sand. The Florida phosphate fields offer good illustrations of what is meant by gravely deposits, while the Tennessee phosphate fields are more sandy deposits. Some of these are also clayey deposits, for the proportion of clay runs very high.

Water for Gravely Deposits

Gravely deposits may be described as containing 60 to 70 per cent of gravel (coarser than ¼ in.) and the remainder is principally sand. The clay is usually, but not always, less than in sandy deposits. When such material is mined dry and sent to the plant by cars or conveyors, the water for washing may be applied in the most economical manner. It largely serves as sprays in the screens by which the sand is separated from the gravel. The water then serves to wash the sand by the settling-out process, and since the sand is so small a proportion of the whole there is a sufficient amount for that purpose.

One hesitates to give figures for the amount of water needed for material of any character, since there are so many conditions which may vary the amount. But in the sand and gravel industry there seems to be a minimum fixed in practice at 1 gal. per min. for 1 yd. of material per day produced, and this, of course, refers to gravely deposits of the character we are now discussing.

Water Required for Sandy Deposits

In washing gravel in a revolving screen, the clay is not carried off as an overflow, but is carried downwardly through the voids and through the screen. Hence the same water may serve to wash several different pieces in its passage, and the water which follows will rinse these pieces and take away any clay that may have been left behind. This is the most economical use of water in washing, but it cannot be applied to sand, for a screen to separate sand from clay is impractical. Hence the settling out process must be applied to sand, and this requires a considerable excess of water. The greater the proportion of overflow water to that left behind in the voids of the sand, the more complete will be the removal of the clay, and therefore comparatively large quantities of water are needed to wash sand. The writer's observation is that about twice as much water is required for sandy as for gravely deposits, or, as a minimum, say 2 gal. of water per minute per yard of daily production.

Water Required for Clayey Deposits

It is easy to see that it requires more water to wash clayey deposits than those which have little clay, because there is so much more to be removed. But there is a further reason for needing more water with much clay present, and that is the effect of clay on the settling of the sand. As everyone knows, clay and water form a sticky mixture, and with low moistures the mixture is so jelly-like that sand will not settle in it at all. As the moisture is increased the sand will settle with increasing rapidity until finally a point is reached at which the effect of the clay is so slight that the sand settles at the same rate as in clear water.

The fine sands are much more affected in settling than the coarse sands, and this is natural, as the exposed surface, in proportion to the weight, is so much greater. Very fine sands, say 100 mesh and finer, require a very high dilution of the clay before a satisfactory settling rate is obtained. The writer once did a great deal of laboratory work on the settling of fine sands in mixtures of clay and water, and found that there was a distinct slowing up of the settling rate, if the mixture contained more than 3 per cent of clay. Such high dilutions as would be required to make a 3 per cent mixture, however, are not often found in practice, it being thought more economical to lose a little of the fines than to pump so much water and provide so large a settling area.

Where a large amount of water has to be provided to dilute the clay, the water ratio is very much higher than anything that has been mentioned before in connection with gravely and sandy deposits. Practice varies at different plants, but at one plant 7 gal. of water per minute were used per yard of daily production, and the dilution of the clay at times was not enough to permit the settling of all the fine sands. This was in a Tennessee phosphate plant, and the amount of clay present was not higher than in the average deposits of the field.

(To be continued.)

Michigan Producers Discuss Freight Rates

FREIGHT rates was the principal topic of consideration at the annual meeting of the Michigan Sand and Gravel Producers' Association, held in Lansing on February 15. At this meeting the 1921 officers were re-elected. These are: President, L. E. Denton, of the Federal Sand & Gravel Co.; vice-president, W. F. Fisher, of the Tecumseh Sand and Gravel Co.; secretary-treasurer, P. D. Hoel, of the Greenville Gravel Co. G. J. Bolender was reappointed executive secretary.

Secretary Bolender showed that the producers are asking the same reduction they did in December, 1920. This requested reduction represents the removal of Ex Parte 74 and 10 cents of General Order 28. The present mileage scale was calculated by the Michigan Utilities Commission from exhibits presented by both shippers and railways to effect a 22 per cent reduction, but only a 9½ per cent reduction was actually accomplished.

Mr. Bolender proved from official sources that 10 roads in C. F. A. territory, where rates were not reduced, had lost 20 per cent of producers' tonnage in the first nine months of 1921 compared with the same time in 1920, while six Michigan lines with reduced rates had a 20 per cent increase.

Mr. Bolender and Secretary Hoel conferred with Governor Grosbeck and the State Highway Commission and won their support. The governor authorized Mr. Bolender to speak for Michigan as well as for the sand and gravel producers and asked the attorney general to assist Mr. Bolender. The Michigan producers pledged themselves to a consistent reduction in price provided the rates were reduced.

The rate case was reopened before the Michigan Utilities Commission on the day following the Association's meeting. At the request of Mr. Bolender, crushed stone and slag rates were included in the hearing. Mr. Matthews of the P. C. C. & St. L. R. R. testified that he no longer opposed the mileage scale; he was emphatically in favor of it for sand, gravel and stone. E. B. Tullis of the B. & O. testified similarly for the commission on the rate scale proposed at the national hearing at Washington:

1 to 20 miles	$ .70	151 to 175 miles	$1.45
21 to 40 miles	0.35	176 to 200 miles	1.50
41 to 60 miles	1.00	201 to 230 miles	1.55
61 to 80 miles	1.10	231 to 260 miles	1.60
81 to 100 miles	1.20	261 to 300 miles	1.65
101 to 125 miles	1.30	301 to 350 miles	1.70
126 to 150 miles	1.40	351 to 400 miles	1.75

The purpose of this scale was two-fold —(1) to produce the same revenue that they were receiving at the time of the proposal, and (2) to remove the chaotic condition of the rates in C F. A. territory. Mr. Tullis did not agree with Mr. Matthews that the scale should be rigid.

Witnesses showed that the utilities commission order had not always been carried out.

Why Lime Is No Longer Used for City Gas Purification

Although Largely Replaced by Iron Oxide, Lime Has Unquestioned Advantages—It Purifies While Iron Oxide Removes Only One Objectional Impurity

By W. A. Dunkley

Editor's Note

THIS ARTICLE was solicited by the editor as one of the series ROCK PRODUCTS has now been running for over two years on the uses of lime in the industries. The author has not made out a very hopeful case for lime manufacturers in this instance. Nevertheless, there is much to be gained by lime manufacturers in having a straight-forward account, such as this, of the reasons why an important field for their commodity was cut off.

One reason why lime is no longer used to purify the gas in our cities is undoubtedly because gas manufacturers are permitted to sell a poorer quality of product than formerly. This is probably permissible since less and less gas is used each year for illumination, the principal use of course being for fuel.

The difficulties and disadvantages in the use of lime are no more impossible to overcome than lots of other industrial problems, and it would seem to be by no means an unattainable goal to reinstate lime in the gas industry.

THE GAS INDUSTRY had its inception a little over 100 years ago. During nearly two-thirds of the intervening period, slaked lime was almost universally employed to purify the raw gas from certain noxious constituents, chiefly the compounds of sulphur, which it invariably contains.

The chief sulphur compounds contained in raw gas are hydrogen sulphide and carbon bisulphide. Lime in the slaked condition combines readily with the former compound, forming calcium sulphide or hydrosulphide and this latter compound has the power of combining with and removing carbon bisulphide from the gas. Lime also has the advantage of removing carbon dioxide from the gas, an inert constituent so far as combustion is concerned.

In the early days of the industry nearly all the gas was used for lighting with open-flame burners. Since the presence of carbon dioxide was detrimental to the lighting value of the gas thus burned, quite out of proportion to its percentage content in the gas, the removal of this constituent (carbon dioxide) was of considerably greater importance then than it has been since the heating value of the gas has become, almost universally, the measure of its value. The amount of carbon dioxide usually present in gas reduces its heating value but slightly and therefore its removal is not important enough to justify the expense.

About 1885, it was found that certain hydrated oxides of iron had the property of removing hydrogen sulphide from gas. Since this is by far the most important sulphur compound in the gas and since the amount of carbon bisulphide and other sulphur compounds is usually negligibly small in the gas from most American gas coals, the choice of purifying agent as between lime and iron oxide had to be decided upon the basis of cost of hydrogen sulphide removal. In this, hydrated iron oxide was so markedly superior to lime that it almost entirely replaced the latter in American gas practice within two or three years after its introduction.

The reason for the superiority of iron oxide will, it is hoped, be made clear by the following consideration:

One cubic foot of pure slaked lime should theoretically combine with or absorb 21.2 lb. = 183 cu. ft. of carbon dioxide alone, or 16.4 lb. = 181 cu. ft. of hydrogen sulphide alone. Practical experience has taught that 1 cu. ft. of good commercial quicklime, when slaked to 2 cu. ft. of slaked lime, will purify from 6,000 to 10,000 cu. ft. of gas containing 2 per cent of carbon dioxide and 1 per cent of hydrogen sulphide. When "shell lime" is used twice the quantity of gas can be purified per cubic foot of lime.

One cubic foot of iron oxide purifying material, containing 15 lb. of metallic iron, which has been converted to 21.5 lb. of iron oxide (Fe_2O_3), will purify 30,000 to 35,000 cu. ft. of gas, containing 1 per cent of hydrogen sulphide, before it is spent. It is evident, therefore, that iron oxide is capable of purifying from three to six times as much gas as can lime for the same volume of material. It has also been found that lime has to be handled three to four times as often to purify an equal quantity of gas. In addition the weight and character of the materials to be handled show an advantage on the side of iron oxide. Another factor in the cost of handling is the number of layers of material that must be used in a purifying box to accomplish the same work.

Slaked lime in the most favorable physical condition for use can be used in layers only 6 or 8 in. thick on account of its resistance to the flow of the gas, while iron oxide is often used in layers 6 ft. thick. Therefore, to use the same volume of lime it would be necessary to have a purifying box contain many more trays to support the purifying material than in the case of iron oxide. The handling of these trays would involve much extra expense. Experience has shown that the cost of purifying gas is much greater with lime than with iron oxide. Another disadvantage in the use of lime is the very offensive nature of the spent material. It creates a nuisance about the gas plant and is very difficult to dispose of. To summarize the relative merits and demerits of the two materials, the following may be useful:

Advantages of the Use of Lime

It purifies the gas more completely when properly handled than does iron oxide, since it removes from the gas not only hydrogen sulphide but also carbon dioxide and carbon bisulphide. Therefore, it still finds some use in Europe where exceptionally stringent sulphur removal regulations are in force, being sometimes used in connection with iron oxide purification. It improves the open flame candlepower and in a lesser degree the heating value of the gas by removing from it the carbon dioxide.

Advantages of Iron Oxide

This process is much cheaper than the use of lime. Volume for volume iron oxide purifies from hydrogen sulphide from three to six times as much gas as does lime. It does not remove carbon dioxide or carbon bisulphide from the gas, but it is cheaper to compensate for the carbon dioxide by enrichment of the gas than to use lime. Carbon bisulphide is usually present in the gas from American coals in such small quantities that it is neg-

ligible and therefore does not have to be removed from the gas. The spent oxide is not so offensive as is spent lime. The labor of handling and preparing iron oxide for use is less than is necessary in handling and preparing lime.

In view of these advantages in favor of iron oxide it seems unlikely that lime will ever displace iron oxide as it was itself displaced. Both processes have inherent disadvantages since they involve the labor of handling a solid material. It is one of the dreams of the gas engineer that in time a suitable method of purifying gas by a liquid reagent will displace the present cumbersome method. Many reagents have been considered, among them slaked lime in suspension in water. Here again the cost of the material, the problem of disposing of the wastes, and the technical attention necessary have prevented commercial success. Other methods of liquid purification have been worked out, but they have not reached the commercial stage where they can compete with iron oxide. It seems, however, that some liquid purification method either used alone or in conjunction with iron oxide will be the next step. There appears to be little likelihood that lime will again find extended use for this purpose.

Limestone Makes Pig's Bones

Calcium in Carbonate Form Makes Better Bones and Better Pork Than Phosphate

IN STUDIES at the Ohio Agricultural Experiment Station by E. B. Forbes and J. A. Shultz, reported in Bulletin 347, it was found that the supplementing of the rations of pigs made up of corn, wheat middlings and linseed meal by the use of different calcium compounds resulted in a slight increase in daily weight over the lack of those elements, and also certain of the compounds had a decided effect upon the characteristics of the skeleton of the animals.

Calcium was fed at the rate of 5 g. per day per animal. The animals weighed approximately 150 lb. at the beginning of the test, and were continued in test for 86 days. The calcium compounds used were calcium carbonate, pulverized rock phosphate, precipitated bone flour and steam bone flour, the last four carrying phosphorus as well as calcium. The rock phosphate had the least influence on the development of the bones, and seemed to be utilized by the animals in least amount.

Caused Greater Density and Strength of Bone

Careful examination was made of certain of the bones of the animals. The phosphorus increased the volume of the bones, but decreased their density. These bones had a low breaking strength. On the other hand, calcium in the form of calcium carbonate increased the density of the bones, and also their strength; that is, it gave a smaller skeleton, yet a stronger one. The steamed bone meal stood next to calcium carbonate in producing these results. Incidentally, it was also observed that the hardest bones which had the highest breaking strength had the lowest content of magnesium and conversely, the softer and weaker bones had the larger proportion of magnesium and phosphorus. The mineral substance of bone was found to be a mixture of phosphate and carbonate of lime. Moreover, to maintain the alkali reserve of the body, it is the carbonate of lime which seems to be drawn upon rather than the phosphate. From the preceding observations, it is evident that the effect of this process would be to decidedly weaken the skeleton. These results particularly emphasize the importance of supplementing the diet of the animal with available lime compounds, especially for animals that must carry a large weight, or where speed and power must be developed, in which the skeleton must play an important part.

Livestock Development Correlates with Lime Supply of Regions

It is an interesting fact that the notable development of individual animals, as well as of breeds of animals, has occurred in those parts of the world in which limestone has influenced the surface soil, and where the animals fed upon the products of those soils may be expected to receive rather large amounts of lime compounds, chiefly in the form of carbonates, in their food and drink. The Arab horse, which is credited with such unusual endurance, and with the possession of bone of unusual density and strength, was developed in the limestone and alkali regions of its native country—the Arabian desert. Our speed horses in the United States have developed in the region of Orange county, New York, and in the Blue Grass region of Kentucky, in the soils of both of which sections lime is an important characteristic. Our most notable dairy and livestock regions are regions where the soils are well supplied with lime compounds. Such, for example, are central New York, western Ohio and southern Wisconsin. All these facts should suggest to the livestock grower in sections of the country not so favored with lime compounds the need for supplementing their diet with those constituents in mineral form.—*Agricultural Lime News Bulletin, National Lime Association, Washington, D. C.*

Hydrators at Kelley Island Gibsonburg Plant

THE ARTICLE on the first page of ROCK PRODUCTS, February 11, 1922, inadvertently failed to mention that the lime hydrators used at the Gibsonburg (Ohio) plant of the Kelley Island Lime and Transport Co. are the type designed by A. H. Lauman, president of the National Mortar and Supply Co., Pittsburgh, Pa.

Most lime manufacturers would immediately recognize the type from the views shown. The selection of this type of hydrator by the Kelley Island company is of particular interest because it gives this company at least one installation of every type of commercial lime hydrator on the market, including the Schaffer, Clyde, Kritzer, Carson and Lauman.

Iowa Gravel Rate Case to Be Heard March 1

LOWER intrastate freight rates on sand, gravel, cement and agricultural limestone will be the basis for the hearing just set for March 1 at Des Moines by the State Railroad Commission. Local shippers will be represented.

The Iowa Sand and Gravel Producers' Association and the Iowa Traffic League instituted a movement for lower tariffs on these commodities some time ago. The hearing was first set for December 6, 1921, continued to January 4 of this year and then indefinitely postponed. Present charges, it is maintained, are delaying construction and preventing the use of limestone as fertilizer.

Indiana Producers' Program

THE executive committee of the Indiana Sand and Gravel Producers' Association on February 10 outlined the association program for this year.

Among the activities planned are the compilation of a freight rate table, the preparation of an exhibit for the office, the extension of testing work to include more field tests, a drive to increase the membership, a publicity program, cooperation with the Allied Motor Commerce, and a definite legislative program. It was also decided to hold a mid-summer meeting of the association and more frequent district meetings, the first of which will be one of Districts Nos. 2, 3, 4 and 5, to be held in Terre Haute some time in April.

Storage Systems and Means of Reclamation

No. 1—Economy of Reclaiming Material from Storage by Use of Cranes, Single Rope Cableways, Belt Conveyors, Power Scrapers, Etc.

By Charles A. Breskin

MUCH has been said and written as to the best way of promoting and developing a demand for a particular product, but one thing is, or should be, self-evident Service is the greatest factor in both creating and maintaining a demand for any product. And service implies a readiness to serve, possible in the small plant as well as in the large plant, too.

By way of preparing for the big business that is apparently to come next season, there is no more efficient method of increasing the season's output than by accumulating a surplus of finished product during the idle months to supply the peak of demand that comes during the summer and fall periods. It is learned on good authority that the demand for rock product materials for the ensuing year will exceed the supply in some localities.

The cost of stocking and reclaiming depends upon the material to be handled and the choice of the device. Whatever the cost may be, it is worthy of note that

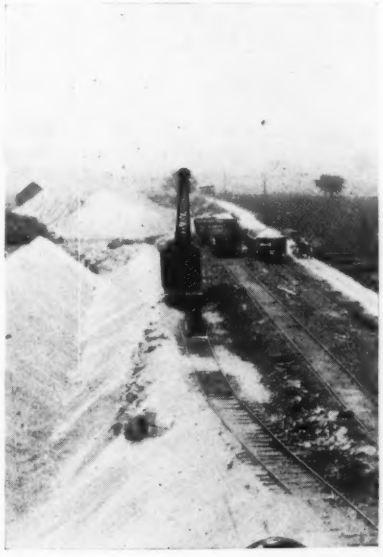


Fig. 1—Locomotive crane reclaiming crushed stone from ground storage

Fig. 2—Ground storage at a sand and gravel plant

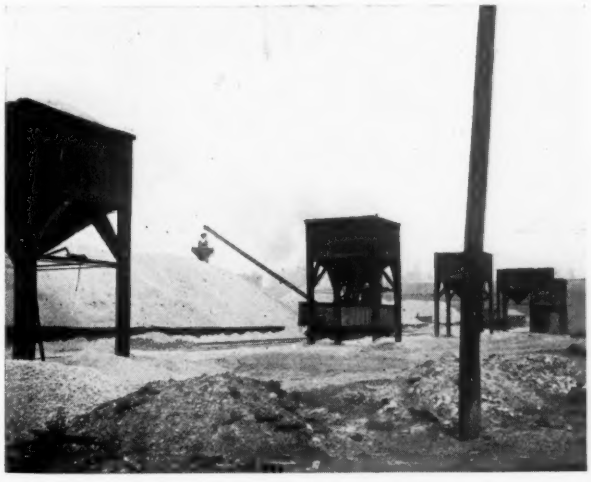


Fig. 3—Storage and bunkers for truck or car loading

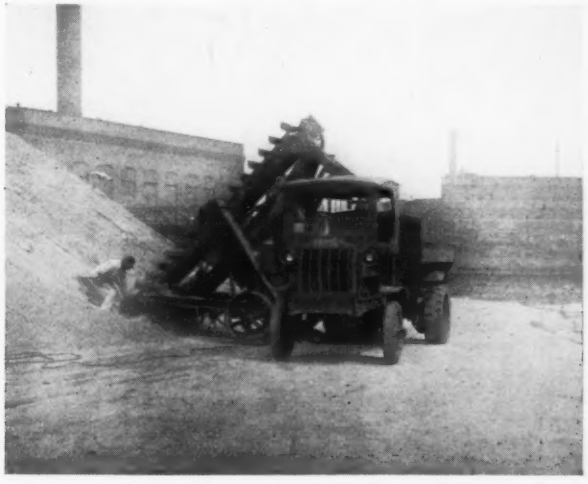


Fig. 4—Portable loader filling truck

Fig. 5—Gantry crane for unloading from barges into ground storage and thence into cars or into bunkers

plants which have a stock pile are usually successful—they make money where others fail. Also, whatever the cost of handling this reserve stock may be, it may be more than offset by the reduction in the overhead expense which results from the plant operating at capacity. The accumulation of a surplus of material during otherwise slow months costs very little. The investment in the stock pile is merely in the distribution of the product and the wearing of parts. Only a little extra can be charged for operating the plant or for fixed charges.

Successful operators, large and small, have resorted to stock piling. It has a tendency to steady the market; there is no wild scramble to dispose of this or that size at a certain season, and there is no necessity to sacrifice anything on any product in order to move it. The surplus product can be held for better times.

A stock pile is a good selling argument in itself. It is positive proof of the ability to deliver; and to a contractor anxious to avoid delays, this has a big appeal. Again, stock-piling is the key to winter sales, especially among crushed stone and sand and gravel producers.

need not be considered. Bins capable of holding three or four days' operation will prove ample in any plant and usually insure steady operation during a temporary car shortage; a failure to get cars spotted for a day, or for other reasons of delay. Bin capacity for one day's product can be made to serve admirably, however, if another stock-piling device is at hand.

Locomotive Cranes

The economy of reclaiming stored materials with locomotive cranes and grab-bucket equipment will in itself demonstrate the advantage of running a plant steadily for stock piling. It is true that $50,000 or $75,000, when expressed in crushed stone or sand and gravel, will make several good-sized piles of material, although it is not unusual for a plant handling a locomotive crane steadily operating in a properly laid out yard in a single season to accumulate storage in addition to its regular handling and rehandling work.

Fig. 6—Stiffleg derrick and clamshell bucket loading from ground bucket

Storing Crushed Stone, Sand and Gravel

Of all the devices for storing crushed stone and sand and gravel, bins and tanks are the most cheaply operated. The cost of loading from bins is almost negligible, but as a means of storing a surplus of material from one season to another it

Fig. 1 shows a ground storage at a crushed-stone plant capable of accommodating 50,000 tons of material. At this plant, during the dull seasons or when a particular size of material is not in demand, the stone is taken from the crushing plant in regular side-dump quarry

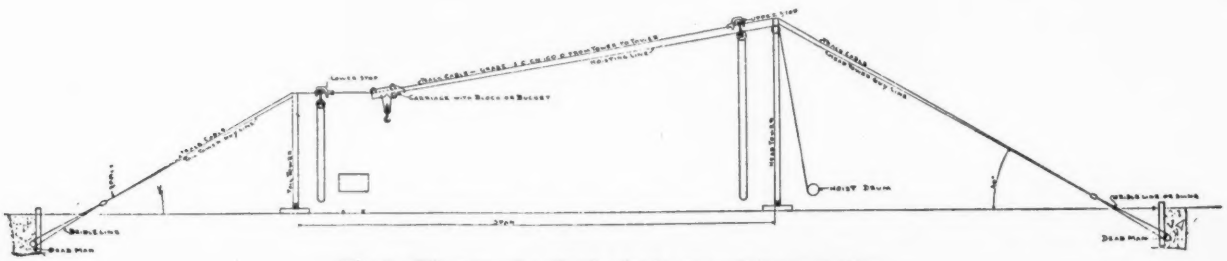


Fig. 7—Diagram of a simple single-rope cableway system

Fig. 8—View of a single-rope cableway system

cars and distributed over the ground storage with respect to size. From the ground storage it is further distributed and loaded into railroad cars by the locomotive crane.

A ground-storage and yard layout at a sand and gravel plan is shown in Fig. 2. The storage is accumulated during the dull periods and is put on the ground wet. By the time it is ready for loading the sand and gravel have been thoroughly drained and therefore are dry when loaded into the cars. This makes winter sales possible and is a great factor in the reduction of overhead expense, which runs unusually high per ton in the plants that lie dormant during the winter months.

A suitable storage for plants or yards located near a market center where a large trucking business is done is shown in Fig. 3. The material is unloaded by locomotive cranes from barges on the river front and deposited in a ground storage. From the ground storage the locomotive crane either loads the material into railroad cars or to bunkers, from which the trucks are loaded by gravity.

Another method of loading trucks or cars from ground storage is shown in Fig. 4. This type of wagon loader is portable and requires but one man for its operation. This wagon loader is self-feeding and automatically digs and elevates the material to the truck or to the railroad car. It is claimed that this machine is capable of handling efficiently 500 cu. yd. of material per 10-hour day. The machine is also used in connection with portable belt conveyors to distribute the ground storage of coal, sand, gravel, stone, etc.

Gantry Cranes, Derricks

The gantry crane is an adaptation of the overhead type of crane to outdoor service where there is no permanent elevated structure on which to install a crane. The crane bridge is fixed on trestles having legs which generally are

Fig. 9—Arrangement of tail tower of single-rope cableway

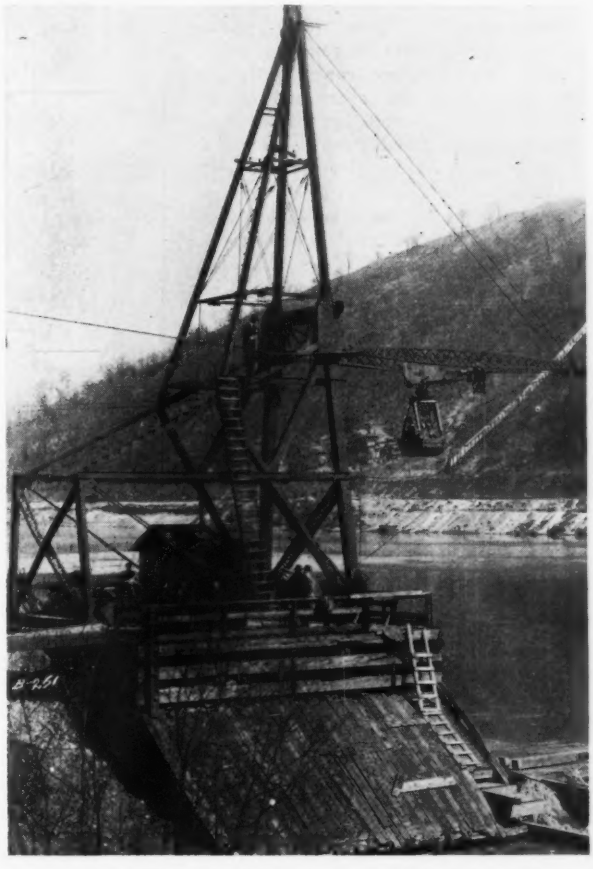


Fig. 10—Arrangement of head tower of single-rope cableway

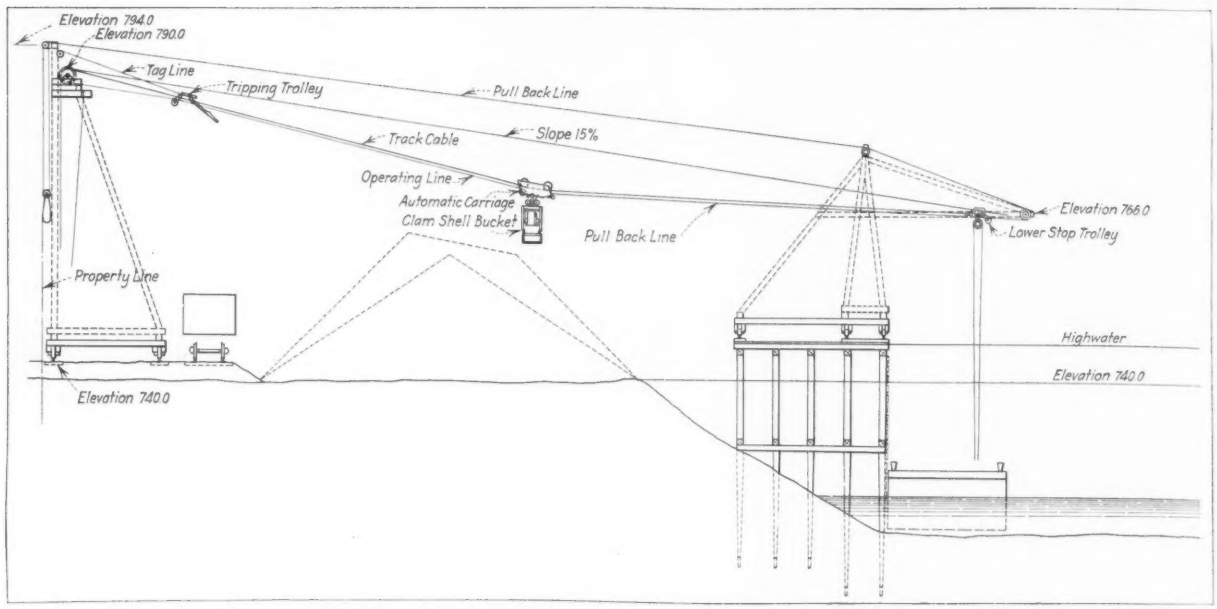


Fig. 11—Diagram of single-rope cableway unloading from barges and distributing over ground storage

mounted on trucks similar to those used on overhead traveling cranes. The crane is then known as a traveling gantry. Whenever the trestles are fixed on a solid foundation the crane is then called a fixed or stationary gantry, and also frequently referred to as a bridge or transfer crane. To meet special operating conditions these cranes are sometimes constructed with one gantry leg—the other end of the bridge being supported by other means; with a single or double cantilever bridge or with a movable cantilever at one end.

While not so flexible as the locomotive crane, the gantry crane is very much used in yards and plants located on waterfronts. It has a wider span than the locomotive crane and operates more quickly and effectively. Fig. 5 shows a gantry crane with a 95-ft. span that moves 365 ft. up and down the landing. This particular yard is located on the banks of a canal in which the material is brought down on barges. A 1½-cu. yd. clamshell bucket on the gantry crane unloads the material from the barges and distributes it over the ground storage or loads it into railroad cars or to bunkers from which trucks and wagons are loaded direct. This operation can be reversed, making the entire operation very flexible.

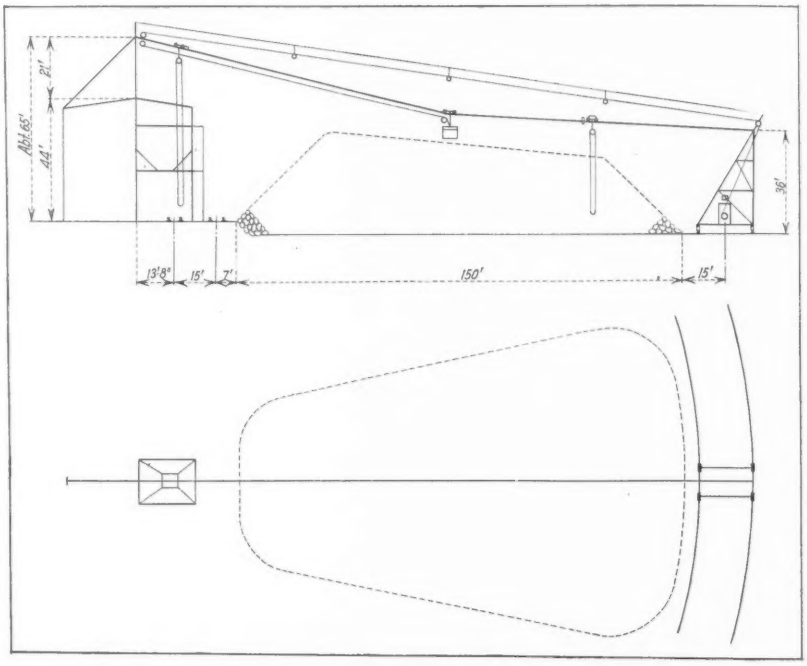


Fig. 11A—Plan and elevation of single-rope cableway

A derrick will perform many of the operations of a crane, and, when the service required is within the scope of the machine, it may be used as a component part of material-handling equipment in any ground-storage system. There are three distinct types of derricks: the stiffleg derrick having the mast supported by stiffleggs or props; the tower derrick, having a tower structure to which the mast is secured and held in an upright position by weights placed at the base and by short braces or guys or stiffleggs usually secured at the top of the mast; the guy derrick supported by guys. For ground-storage systems only the stiffleg and guy derrick will be considered.

The stiffleg derrick and the guy derrick are also used for reclaiming from ground storage, depending upon plant conditions. Both types are made in either traveling or stationary types. The stiffleg derrick is particularly well adapted to locations where it is impossible to run guys and where it is not necessary to swing the boom more than three-quarters of a circle. Other advantages are that the stiffleg derrick is easy to set up and a long boom can be used. With a derrick it is possible to change the boom radius while the bucket is being raised or lowered, thus speeding up the work. Fig. 6 shows a stiffleg derrick equipped with a bull wheel and clamshell bucket used to load silica sand from the ground storage into the railroad cars.

Cableways and Cableway Buckets

Rehandling of crushed stone, sand-gravel, coal, clinker and other loose bulk materials from storage piles into cars, or vice versa, can also be accomplished by cableway installations with clamshell buckets.

The single-rope cableway system, as its name implies, requires only one hoisting cable for its operation. Any single drum hoist may be used for power. Because it employs only one hoisting line, a single rope cableway is easy to set up and operate. It is also comparatively easy to shift—that is, to take down and set up in a new location; likewise, it is relatively low in first cost. The writer is indebted to the Blaw-Knox Co. for the illustration and information on the various single-rope cableway systems:

A diagram of a single-rope cableway system is shown in Fig. 7. A track cable is stretched on a slope between two towers. On this track cable rides a carriage to which a standard clamshell bucket is suspended by a bale. The hoisting line extends from the engine, over a sheave at the top of the tall or head tower, beneath the track cable the carriage, over a sheave in the carriage, through the bucket and back to the carriage, where it is made fast. When this line is allowed to pay out, the carriage-carrying bucket suspended below it moves down the track cable until it reaches the "lower stop." Here a latch on the end of the bucket automatically engages the stop and at the same time the bucket bale is released. The bucket suspended "in the bight of the line" is then lowered by further paying out the line until it rests upon the material to be handled and the hoisting line is without a strain. The bucket is then ready to dig.

Pulling the line closes the bucket and then lifts it with a load of material. When the bucket bale enters the carriage it is locked thereto and the carriage is automatically released from the stop, so that it is free to move upward along the track cable until it encounters the upper stop. The line is then allowed to pay out, the carriage engaging itself to the upper stop and releasing the bucket, which is then lowered. Upon again being hoisted to the upper stop, the bucket bale engages the carriage, causing it to release the stop. Paying out the line allows the carriage to convey the bucket along the cable.

Such an installation is shown in Fig. 8. The tail tower is an A-frame, mounted on a car running on a track that describes a circular arc about the head tower. The length of track cable between towers in this installation is 220 ft.

The bucket may grab a load beneath either stop, but it cannot leave the carriage between stops. To shift the point where the load is taken, it is necessary to shift a stop. This is made an easy matter by providing hand lines from the stops reaching to the ground. By pulling the hand lines the clamps holding the stops from slipping along the track cable may be tightened or loosened.

The arrangement of the tail tower of a single rope cableway at the Charleroi, Pa., plant of the Pittsburgh Plate Glass Co. is shown in Fig. 9. Here during the summer months sand for grinding glass is received in barges on the Monongahela river and then dumped antomatically by the bucket upon a large storage pile on the level ground beyond the river bank, whence it is taken by other means, as required. A storage of several thousand yards is thus provided for winter use. The track cable in this installation is 400 ft. long. This equipment has handled 50 loads per hour from the barges, each load weighing about 3000 lb. Fig. 10 shows the arrangement of the head tower for this installation and Fig. 11 is a diagram of the entire system.

Another cableway layout is shown in Fig. 12. The material is brought over a railroad trestle and dumped into a hopper or pocket below the trestle. The cableway bucket takes the material from the pocket and distributes it over the ground storage. The tail tower runs on a track that describes an arc about the head tower, thus making a fan-shaped ground storage.

(To be continued)

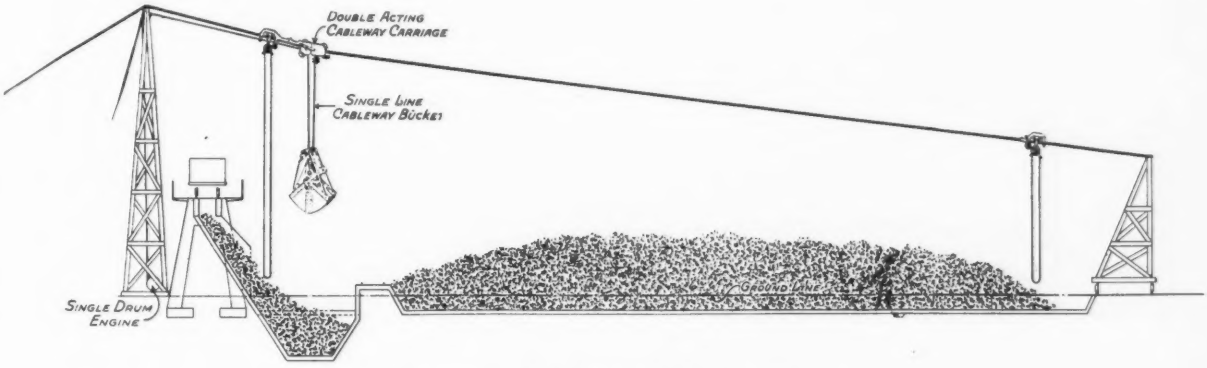


Fig. 12—Another type of single-rope cableway

Arkansas Engineers Urge State to Build Cement Plant

A RESOLUTION was passed by the Arkansas Chapter, American Association of Engineers, at its annual meeting on January 28 urging the governor of Arkansas to investigate the feasibility of establishing a state cement plant, to be operated by convict labor. The action results from a belief that cement manufacturers have kept the price of cement up to such exorbitant figures that both public and private work is held up. Road-building especially is said to be suffering from these conditions.

Solvay Process Co. to Clear Extensive Holding

THE Solvay Process Co., Syracuse, N. Y., is preparing to clear its tract of 3000 acres of marsh land situated in northeast Seneca county during the year. When cleared the ground will be leased until desired for use by the company. The tract was made tillable by the construction of the New York state barge canal. About 100 acres were placed under cultivation last year and proved profitable. The tract will be drained by ditching.

Bricks May Be By-Product of Oil-Shale Industry

THE experiment of making brick from the spent shale of the oil-shale mines of Scotland is now being tried, says *Popular Mechanics.* The finely ground shale is mixed with a small percentage of lime, enough water being added to form a thick paste, which is then pressed into shape and dried in steam tunnels. It is claimed that these brick are superior to clay brick.

How to Cut Costs in Slate and Other Quarries

Practical Methods for Reducing Labor Costs and Waste in Quarrying Operations Which Every Operator May Profitably Adopt

By Oliver Bowles
Mineral Technologist, U. S. Bureau of Mines

IT is apparent to everyone that if a material reduction could be brought about in the cost of producing slate the product could be placed on the market at prices which would enable it to compete more favorably with other roofing, structural, or electrical materials. This is a problem to which everyone has probably given much thought. As Mineral Technologist in the U. S. Bureau of Mines I have devoted most of my time for the past two years in studying various phases of the slate industry, and the one great object which has been kept prominently in view throughout this study has been means of increasing efficiency in quarrying and manufacturing operations in order that production costs might be reduced. The results of some of these studies, particularly those relating to waste, have already been published in pamphlet form. The main bulletin covering the entire industry is now ready for printing and should be available in a few months.

As practically every operating slate quarry in the United States has been studied in the preparation of this report, it is possible that I may be able to offer a few suggestions of some practical value in connection with this important problem of reduced production costs. I shall not attempt to enter into details, but merely to point out in a general way some of the possible avenues through which costs might be reduced.

Advantages from Mechanical Equipment

In the first place it is well to emphasize the great advantage to be gained from the use of mechanical equipment. Wages constitute a very important part of the total cost of slate production and any marked increase in production per man per day must result in reduced costs.

The labor problem may become acute. I am told by one producer today that if a great increase in production were demanded there would be difficulty in obtaining the necessary labor, for while the mills have been slack, laborers have sought other occupations. It may become imperative that labor shall be conserved by the use of machines. This is an age of mechanical equipment. In some industries it has been developed to such a point that two or three men can control the machinery that accomplishes the same work formerly done by a thousand men. It may not be possible to carry the mechanical conduct of slate manufacture to such a point, but there is undoubtedly a field for development along this line. Slate splitting and trimming are still accomplished almost entirely by hand methods. It is probable that every slate producer here claims that mechanical splitting and trimming are not possible of accomplishment, but I venture to prophesy that inventive genius will yet overcome the difficulties and devise equipment that will permit a tremendous increase in slate production per man.

SLATE producers of the United States met in conference at New York on February 8, in response to a general call issued by the National Federation of Construction Industries, and elected a committee to prepare a plan for the formation of an association of slate producers. At this conference several matters of interest and importance to all rock producers were presented, among which is the accompanying talk on methods of cutting operating costs in the quarry. Every producer of rock products may read this with profit.

There are other fields, however, where mechanical equipment may be put to immediate use. Channeling machines which have proved very successful in some districts are almost unknown in others. The mechanical handling of waste and overburden is a field where great improvement is possible and where the cost of handling such materials could be very greatly reduced. Slow hand methods may be replaced by such simple equipment as clamshell bucket or dragline scraper, that may be operated on the cableways. With such devices one man could easily do the work of 10 as they now work in many places.

There is probably no field that offers greater possibilities for cost reduction than that of waste. The excessive waste that accompanies slate quarrying and manufacture is so well known as to require no comment. There are two possible ways in which this problem may be approached. They may be termed waste elimination and waste utilization. The first deals with ways and means of cutting down the proportion of waste, while the second has to do with means of profitably utilizing unavoidable waste.

How Waste May Be Reduced

As a result of two years' study of the slate industry I have come to the conclusion that waste elimination offers a much more fruitful field than that of waste utilization. Certain definite results have been obtained pointing to useful applications of waste slate as a result of a nine months' campaign among possible users involving many tests of pulverized slate. While a certain amount of waste may, therefore, be utilized it is probable that more far-reaching results may be obtained by devoting time and energy to the determination of methods whereby the proportion of waste may be reduced.

I may point out briefly some of the important ways in which this may be accomplished. In the first place much of the waste is due to certain imperfections in the rock such as ribbons, knots of silica, joints, and so forth. The important point to be kept in view in dealing with imperfections is to quarry in accordance with them. That is, to make channel cuts or lines of drill holes parallel and if possible coincident with ribbons or other imperfections and to make another set of divisions at right angles to them. By this means many of the imperfections may be eliminated and sound blocks obtained. If care is not taken to quarry in this manner the imperfections may run diagonally in the block and thus result in excessive waste.

The second way in which waste may be reduced is to cut down the use of explosives to a minimum. In some quarries visited during the past year explosives were used very generally in breaking

as a result of the blows of the channel bars. Such waste may be greatly reduced by changing the stroke of the channeling machine so as to strike light and rapid blows rather than slow and heavy ones. The operator should take up this matter at once with the manufacturer of the channeling machine.

More Products to Reduce Waste

Another way in which costs may be eliminated is in the manufacture of a greater variety of products. Masses of slate unsuitable for certain purposes may be used to great advantage for other products.

Thus ribbon slate which cannot be used for roofing or blackboards may be used for structural purposes. There is a broad field for the development of slate novelties which would utilize many small pieces. Toy building blocks such as are now made of cement, coffee-pot stands, various small utensils for holding pens, paper clips, ink, paints, and so on, and table calendar pad bases are some of the possible novelties that might be suggested. Slate presents an excellent surface for painting, consequently many waste slabs might be utilized for sign boards.

Less Handling Means Lower Costs

Another way in which waste may be reduced is through the avoidance of rehandling of materials. Operators should develop as many short cuts as possible in transportation. Handling heavy material such as slate is costly, and rehandling adds greatly to the expense. One great advantage of the overhead cableway is its ability to deposit waste at a considerable distance from the pit at a single operation. Too much emphasis cannot be placed on the necessity for moving waste to a sufficient distance that no rehandling will ever be required. The abandonment of quarries occasioned by the sliding of waste heaps into the pits is one of the tragedies of the slate industry.

Simplification of process in handling materials is applicable both to waste rock and to good material. I have observed quarries where an overburden of clay and broken rock was thrown to the bottom of the quarry by laborious hand methods with shovel, pick, and bar, loaded into pans by hand methods, and removed by cableway. In this age of mechanical equipment such slow and costly means of moving materials would scarcely be countenanced even in the handling of gold bars in the basement of the United States Treasury. How much less should it be encouraged where worthless materials are concerned?

There is less room for criticism in the methods of handling good slate. Blocks hoisted from the quarry are usually deposited on cars and hauled directly to the mills or shanties where they are manufactured into finished products. There is opportunity, however, for simplifying and rendering less laborious the process of handling finished slates. At two plants observed the slate racks are mounted on wheels and so may be guided over tracks to the piling yards, thus avoiding the heavy task of loading them on cars.

I have briefly outlined just a few of the possible ways in which production costs may be reduced. It is important that each operator should be familiar with all the various types of equipment employed, not only in his own industry but in related industries, and this afternoon we shall consider a way in which such knowledge may be disseminated.

Why Trade Associations Should Be Encouraged

Secretary of Commerce Hoover, in Communications with the Attorney-General, Indicates His Attitude in Favor of Association Activities

MR. HOOVER'S favorable attitude toward trade associations, recently evidenced in the correspondence made public between him and Attorney-General Daugherty, has been attacked by Senator Norris of Nebraska.

In a long communication to the attorney general, the Secretary of Commerce outlined a number of activities which in his judgment organized business might legally and properly carry on. The reply, while not disagreeing with Secretary Hoover's views, nevertheless does not commit the attorney general to a definite stand.

Mr. Hoover's attitude is that trade associations fill a necessary place and that legitimate activities should be encouraged by removing the doubt and confusion which exists concerning the legal limits within which trade associations could properly operate. Senator Norris has been quoted as saying, "It is quite evident to me that whatever, if anything, is left of the Sherman anti-trust law, as it applies to big business, has been repealed by Mr. Hoover. If it means anything, it means that in the future no attempt will be made to prosecute big business because it combines or forms a monopoly, providing it is done according to the methods mapped out in Mr. Hoover's letter."

The following extracts from the correspondence between Mr. Hoover and Mr. Daugherty—which is given practically complete below—show clearly Mr. Hoover's attitude:

Why Facts and Statistics Are Necessary

Commercial progress in industry has always been measured by the advance in knowledge of those engaged in industry. It is impossible for men to acquire or secure all possible knowledge at one time. Its acquisition is a growth resulting from continuous, intelligent inquiry. The knowledge of an industry that is necessary and essential to its success must embrace all facts and circumstances that will in any way influence that industry. These facts and circumstances must include economic conditions as well as scientific facts to the extent that science is called into play in its operation and all commercial conditions that make for efficient production, merchandising, and distribution. No one will dispute the foregoing statements; they are fundamental and necessary to the life of trade and commerce.

The difficulty seems to lie in the determination of the means and methods that may be adopted to secure this necessary information. Little, if any, trouble is experienced in securing the admission that an individual may secure knowledge of these facts by any means that would not constitute an individual crime, and that he may use the information in such manner as his best judgment may tell him will bring him the greatest benefit.

But when two individuals engaged in the same line of industry undertake to provide a means for securing facts necessary and essential to the economic and efficient conduct of their respective organizations, this form of endeavor seems to at once assume an aspect of difficulty that, in my judgment, is in no way justified by a proper consideration of the underlying necessities therefor.

Right for One; Why Not for Many?

The individual sets up some form of instrumentality to secure the information without which, in the management of his business, he would be groping in the dark. His competitor across the street does the same thing, and each, securing his information in his own way, uses it as he sees fit, and the action of either one has not offended the majesty of the law. Yet, if the two seek to join the instrumentality each has used for information purposes

and the same information is received through one instrumentality and the information given to each and it is used in the same way that it was before, it is suggested that the collective activity in the use of the consolidated instrumentality should not be permitted because of the greater ease and facility thereby afforded for the two individuals to make improper use of the information so acquired. In other words, the objection does not go to the instrumentality, but to the abuse of the information that may be secured through the collective means.

The principle is the same whether two or two hundred join together in securing the information.

Trade associations have been in existence for many years. The great majority are legitimate, both in form of organization and in activity. The minority, while lawfully organized under articles expressing lawful purposes, may engage in activities that are evidence of purpose contrary to and outside of the declared purposes in the articles of organization.

Again, a trade association may have lawful form of organization and the activities of its officers may be clearly within the purposes declared in the association charter, and yet members of the organization may, by unlawful confederation, use the information lawfully secured for unlawful purposes. It may, therefore, truthfully be said that the line dividing the good association and the bad, the proper activity from the improper one, and the lawful activities of the officers of an association from the unlawful acts of the membership, cannot be determined, in every instance, with singular ease. It is my belief, however, that it is more easy to determine the forms of organizations and activities that are generally recognized as good than to determine in advance those that may be bad, because, in the latter instance, the peculiar facts relating to each association the subject of inquiry may determine whether the organization or its members are operating in violation of law.

It is with much earnestness that I claim there is propriety, generally speaking, in trade associations. Their lawful field of endeavor is large, and their activities work for promotion and advancement of the public welfare and for progressive economic organization. In making this statement, I am not unmindful of the fact that the impression exists with a small minority that individual prohibited acts may be accomplished by organization under the disguise of a trade association. However, to make my position clear regarding the trade associations the existence of which I advocate, I desire to say that I have always taken the view that no body of men could combine in the form of a trade organization and do any act or thing forbidden by law if they were undertaken by them outside of a trade organization. The character of trade organization the existence of which should be preserved is one that carries lawful purposes only in its articles of association; its activities must be in harmony with its declared purposes. The articles of association, with their lawful, declared purposes, must not be used as a mask to hide unlawful purposes. In other words, the organization cannot be used to conceal or disguise any contract, combination, conspiracy, agreement, or understanding, secret or otherwise, on the part of the officers of the organization or on the part of the membership or any part thereof to engage in activities in restraint of trade or otherwise in violation of the anti-trust laws.

There has been much information collected by legitimate trade associations in which the general public has no interest whatsoever, yet information of this class has always been freely offered to the daily and the trade press, as well as to any governmental agency that might desire the information as a matter of statistical record. On the other hand, certain statistical data are collected by trade organizations that would be of vast value to the public generally if published in practical, available form.

Many of the trade associations securing and disseminating the statistical data mentioned have restricted the same to its membership, while others have undertaken to give the same to the public through the daily and the trade press concurrently with its members. The trade associations of the latter class are in the minority.

Information lawfully secured regarding trade and economic conditions made public for the information of everyone cannot be harmful. Information secured solely for the benefit of members and of a character that puts the membership, by reason of the information, in a position of advantage as compared with the public without such information cannot be sanctioned by sound public policy. The act of securing the information and the use of it by the members of a particular organization may be perfectly lawful in itself, but it is my belief that good morals and a sense of fair dealing require the giving of the information secured in this collective manner to the public generally, to the end that all persons engaged in commercial transactions involving the information in question will be on an even footing.

The activities of trade associations that have received the greatest criticism involve the collection of statistics relating to volume of production, capacity to produce by districts of production, wages, consumption of products in domestic and foreign trade, distribution thereof including volume of distribution by districts, together with figures as to stocks on hand, wholesale and retail, by districts, coupled with information as to price, either in the form of individual reports of each member distributed to every other member or the individual prices reported to the association and by the latter compiled and averaged by districts for certain specified periods.

Making Association Information Public

If information regarding production, capacity, and distribution by districts, with average prices for grades, brands, sizes, styles, or qualities sold in the respective districts for specified periods of time could be given to the public at the same time that such information is available to the members of an association, in my judgment, great public good would result. With this information available, everyone dealing in the products of a given industry, whether buyer or seller, would have the same information regarding conditions and, in dealing with one another, would have knowledge of the same facts upon which to form their judgments as to the proper course to pursue.

A majority of the associations collecting data of the nature indicated have distributed it only to members of the association, while others have undertaken to give the information to the public through the daily and trade papers. Publication of the information by these associations in the daily press has not been general, and its availability to the public has been largely through the medium of trade papers, and through the daily press to the extent that the latter may have been utilized. When published through trade papers this information should be released to members only after such publication.

Eleven Questions on Legitimate Activities

With these observations, which have been extended at greater length than I intended, I desire the informal expression of your views as to the following activities on the part of trade associations and their members wherein neither the form of the association nor the activity, which appear perfectly fair and lawful on the surface, is used to hide or conceal some contract, combination, conspiracy, agreement, or understanding, secret or otherwise, on the part of the association, the membership, or any part thereof to actually restrain trade or otherwise violate the Sherman Act:

(1) May a trade association provide for its members a standard or uniform system of cost accounting and recommend its use, provided that the costs so arrived at by the uniform method are not furnished by the members to each other or by the members to the association and by the latter to the individual members?

(2) May a trade association advocate and provide for uniformity in the use of trade phrases and trade names by its respective members for the purpose of ending confusion in trade expressions and for harmony of construction as to the meaning of trade phrases, names and terms?

(3) May a trade association, in co-operation with its members, advocate and provide for the standardization of quality and grades of product of such members, to the end that the buying public may know what it is to receive when a particular grade or quality is specified; and may such association, after standardizing quality and grade, provide standard form of contract for the purpose of correctly designating the standards of quality and grades of product; and may it standardize technical and scientific terms, its processes in production, and its machinery; and may the association co-operate with its members in determining means for the elimination of wasteful processes in production and distribution and for the raising of ethical standards in trade for the prevention of dishonest practices?

(4) May a trade association collect credit information as to the financial responsibility, business reputation, and standing of those using the products of the industry; and may the association furnish such information to individual member upon request therefor, provided such information is not used by the association or the members for the purpose of unlawfully establishing so-called "blacklists."

(5) May a trade association arrange for the handling of the insurance of its members, including fire, industrial, indemnity or group insurance. In other words, can the members of an industry, through the agency of a trade association, arrange for or place all of the insurance of the members?

(6) May a trade association, in co-operation with its members, engage in co-operative advertising for the promotion of trade of the members of that association engaged in the particular industry; and may the association engage in such form of promotion by furnishing trade labels, designs and trade-marks for the use of its individual members?

(7) May a trade association, for and in behalf of its members, engage in the promotion of welfare work in the plants or organizations of its members, which welfare work includes sick benefits and unemployment insurance for employees, uniform arrangements for apprenticeship in trade education, the prevention of accident and

the establishment of an employment department or bureau for co-operation with employees?

(8) May a trade association, in co-operation with its members and acting for and in behalf of its members, handle all legislative questions that may affect the particular industry, regarding factories, trades, tariff, taxes, transportation, employers' liability and workmen's compensation, as well as the handling of rate litigation and railroad transportation questions?

(9) May a trade association, in co-operation with its members and acting for and in their behalf, undertake the promotion of closer relations between the particular industry and the federal and the state departments of government which may have administration of laws affecting the particular industry in any form?

(10). A. May a trade association collect statistics from each member showing his volume of production, his capacity to produce, the wages paid, the consumption of his product in domestic or foreign trade, and his distribution thereof, specifying the volume of distribution by districts, together with his stock, wholesale or retail?

B. And may such trade association, on receipt of the individual reports of each member, compile the information in each report into a consolidated statement which shows the total volume of production of the membership, its capacity to produce by districts of production, which, in some instances, include a state or less area, the wages by districts of production, the consumption in foreign or domestic trade by districts, the volume of distribution by districts, and the stocks on hand, wholesale and retail, by districts?

C. And if, after compiling the information as aforesaid, the information received from the members as well as the combined information is not given by the association to any other person, may it then file the combined statement with the Secretary of Commerce for distribution by him to the members of the association through the public press or otherwise and to the public generally and to all persons who may be in any way interested in the product of the industry, it being understood that the individual reports for the members should cover either weekly, monthly, quarterly, or longer periods as may be deemed desirable by the members, and, when a period is adopted, the report for each member shall cover that period, and the combined report shall be for that period?

(11) A. May a trade association, at the time it collects the production and distribution statistics above outlined, at the same time have their members report the prices they have received for the products they have sold during the period taken, specifying the volume of each grade, brand, size, style or quality, as the case may be, and the price received for the volume so sold in each of the respective districts where the product is sold?

B. And may the association, without making known to any person the individual price reports of any member, consolidate all of the reports into one, and show the average price received for the total volume of each grade, brand, size, style, or quality, as the case may be, distributed in each district covered by the distribution statistics for the period covered by each individual report?

C. And may the association, after making such compilation, send the compiled report as to average price, as aforesaid, to the Secretary of Commerce, to be by him distributed to the public and to any or all persons who may be interested in the particular industry making the reports.

In order to avoid repeating this question in connection with each one of the activities outlined in the eleven preceding questions, may trade associations engage in any or all of the activities named without violating the law, provided the organization and the activity engaged in are not for the purpose of hiding or concealing some agreement, contract, and so forth, to actually restrain trade or otherwise violate the anti-trust laws?

Mr. Daugherty's Answer

To the questions from Secretary Hoover, Attorney General Daugherty returned answers favorable to trade associations. The Hon. Mr. Daugherty's reply follows:

With reference to the first paragraph, there is no apparent objection to a standard system of cost accounting, but I think associations should be warned to guard against uniform cost as to any item of expense. For illustration, a strong effort has been made by some lumber associations to take as a basis for estimating costs of production a uniform charge for stumpage. Of course, the cost of the timber in the tree to the different manufacturers who own their timber in the woods greatly varies; and as to each it should be charged at its actual cost. It is as clearly a violation of the law to agree upon the cost of an item that constitutes a substantial part of the total cost price when its cost actually varies, as to agree upon the sales price, because the sales price is substantially affected by such agreement. It has been ascertained that the members of one association go so far as to fix a uniform cost price, leaving to each member to determine what per cent profit he will add, thus eliminating entirely competition in so far as affected by the cost of production.

Furthermore, I have serious doubts about the advisability of the latter part of the sixth paragraph. I can see no objection to co-operative advertising designed to extend the markets of the particular article produced or handled by the members of an association, but when the several producers or dealers use uniform trade labels, designs and trade-marks it seems to me the inevitable result would be a uniformity of price. Where two competing articles are advertised in precisely the same way and bear exactly the same label or trade-mark, it certainly would be difficult for one to be sold at a higher price than the other, although its quality may be superior. In a way this is illustrated in the cement industry. There a standard of quality has been adopted. That is, it is necessary for all cement to comply with a certain standard, but in practice no manufacturer undertakes to make, or at least no one advertises that he does make, a grade of cement superior to that standard. The result is that there is no competition in the sale of cement so far as quality is concerned. It seems to me, therefore, that it would be well to eliminate the latter clause in paragraph six, to wit, "and may the association engage in such form of promotion by furnishing trade labels, designs and trade-marks for the use of its individual members?"

Other Activities Not Illegal

I can now see nothing illegal in the exercise of the other activities mentioned, provided always that whatever is done is not used as a scheme or device to curtail production or enhance prices, and does not have the effect of suppressing competition. It is impossible to determine in advance just what the effect of a plan when put into actual operation may be. This is especially true with reference to trade associations, whose members are vitally interested in advancing or, as they term it, stabilizing prices, and who through the medium of the associations are brought into personal contact with each other. Therefore the expression of the view that the things enumerated by you, with the exceptions stated, may be done lawfully is only tentative; and if in the actual practices of any of them it shall develop that competition is suppressed or prices are materially enhanced, this department must treat such a practice as it treats any other one which is violative of the Anti-Trust Act.

Secretary Hoover's reply to this communication served principally to clear the situation with regard to the last clause of question (6). His reply follows:

Your observations regarding the last clause in question (6) in my letter are wholly sound, based on the language of that clause. It was not, however, my idea that each constituent member of a trade association would use a community trade-mark on his product, i. e., the same trade-mark that was used by every other member of the association, and, therefore, the last clause in that question was unhappily worded. The question really relates to trade promotion through co-operative advertising, in which certain trade slogans are used, such as, "Made in Grand Rapids," which was adopted by the furniture manufacturers at that furniture center. Generally, activities covered in question (6) are conducted by a trade association in a given local community. An organization at Chicago advertises for its entire membership, which includes every line of commercial endeavor in Chicago, that the city is the great central market. It is co-operative advertising of this class that tends to promote trade extension in given lines or collected lines of industry. Certain of the trade associations, however, do devise trade-marks, not for use by all members, but for individual members. It is a well-known fact that when some manufacturer or producer is fortunate enough to select a trade-mark that appeals to the public, it becomes a great aid in selling his commodity and, as a result, it is well advertised until it becomes a household word. Other producers or manufacturers of the same kind of an article, in order to take advantage of this situation, will devise a trade-name or trade-mark as near to that of the successful competitor as he thinks he can go and still escape suit under the trade-mark or unfair competition laws. The activities of a trade association regarding trade-marks to which I referred in my letter of the third relate to the straightening out of instances of unfair competition or infringement as between the members by undertaking to design trade-marks for the individual members of the association making the same product that would absolutely prevent confusion on the part of the public as to the producer or manufacturer of the given article and, at the same time, remove all claim of infringement or unfair competition. In other words, the trade-mark activity referred to was that of making the trade-marks of each individual member distinctive instead of common. You may, therefore, consider the part of my question (6) referred to in your letter as eliminated from the question, and that the question was really intended to cover the matters stated herein. With this explanation, I feel sure you will agree with me that our views on the matters presented are in complete accord.

Washing Phosphate with Improved Equipment

Charleston Mining and Manufacturing Company Erects New Type of Rock Phosphate Washing Plant at Mount Pleasant, Tennessee

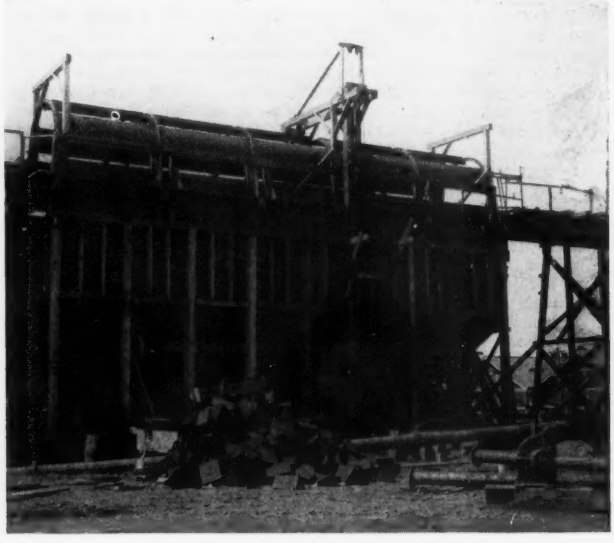
THE Charleston (S. C.) Mining and Manufacturing Co. has recently installed at its plant near Mount Pleasant, Tenn., a special design of washing plant for cleansing and concentrating ground phosphate rock. This company, which is a subsidiary of the Virginia-Carolina Chemical Co., one of the largest commercial fertilizer manufacturers in the United States, is one of the largest "brown rock" producers in the phosphate district of Tennessee. The washing plant probably contains more machinery and equipment of special design than any other plant in the phosphate business, in so far as preparation and cleansing of phosphate rock is concerned. The mining methods at this plant employ the usual steam-shovel and dragline operations.

The rock phosphate is delivered to the plant from the mines in trainloads of 70 cu. ft. side-dump wooden cars. These cars are moved to the new plant on a 390-ft. trestle over a 1¼ per cent grade and are delivered to a five-car capacity rotary car dumper, operated by either compressed air or steam for power. The dumper is 70 ft. in length and has a rope fastened about its center and attached to the cylinder, so that the down-stroke will turn the cars over and the up-stroke will right them.

Located directly underneath the car dumpers is a ½ V-bin into which the material is dumped, then washed out by a hydraulic monitor and flushed directly to a short drag conveyor which serves as a dewaterer. The overflow from the drag conveyor goes directly to a sand pump and sand recovery bins, while the discharge, consisting of lumps and coarse sand and the clay that has not been broken up by the action of the hydraulic monitors, goes to a set of 16x36-in. rolls. The rolls break up the lumps too large for handling by elevators and log washers.

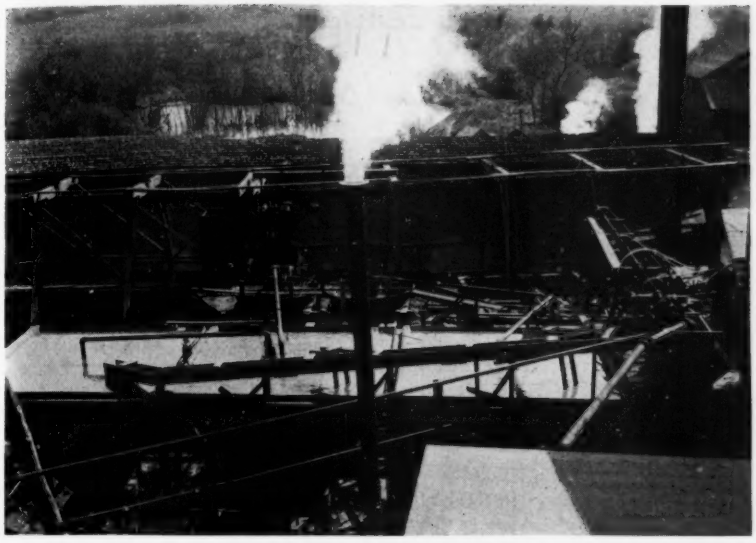
From the rolls the material goes to a bucket elevator which serves a double

Panoramic view showing cars on trestle approaching the washing plant



Side view of rotary car dumper

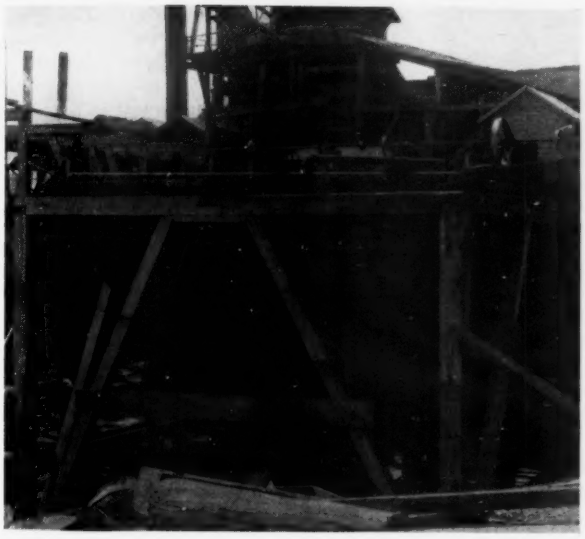
Rotary car dumper in operation



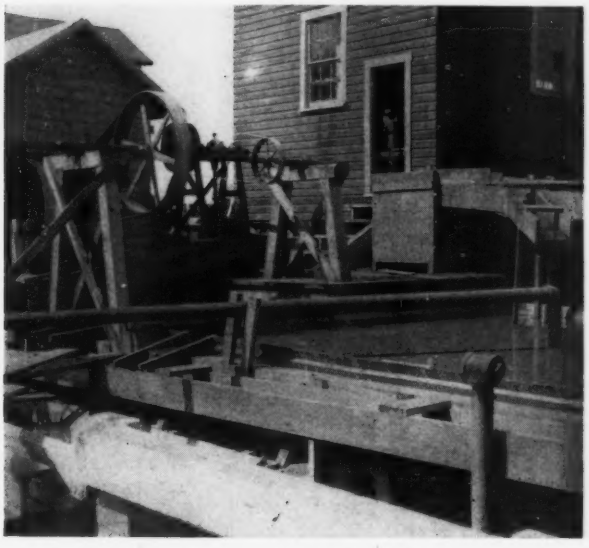
Settling tanks and Allen cones

purpose: to elevate the material and to agitate it by giving it a thorough washing and to further break up the mud balls. On leaving the elevator the material goes to two hexagonal scrubbers, set in tandem and equipped with lifting flights to give the material a still further cleansing and to break up the lumps.

On leaving the scrubbers the material goes to a 14 in. x 10 ft. hexagonal screen with 3/32-in. perforations. The undersize goes to a centrifugal sand pump where it joins the overflow from the drag conveyor, while the oversize goes to a set of double log washers and the material is again thoroughly cleansed. The log washers discharge into a second bucket elevator which delivers into a hexagonal screen similar to the first hexagonal screen, except that it has ¼- and ¾-in. perforations, evenly divided over the surface of the screen. The material ¼ in. and under goes to the centrifugal sand

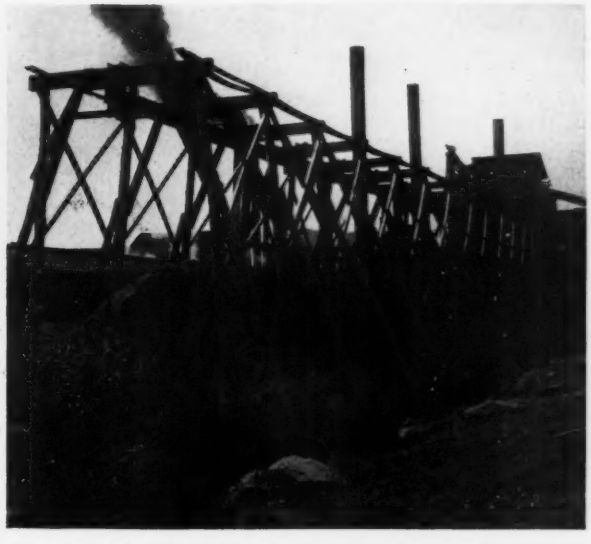


Inverted pyramidal type settling tank



Top view of settling tanks

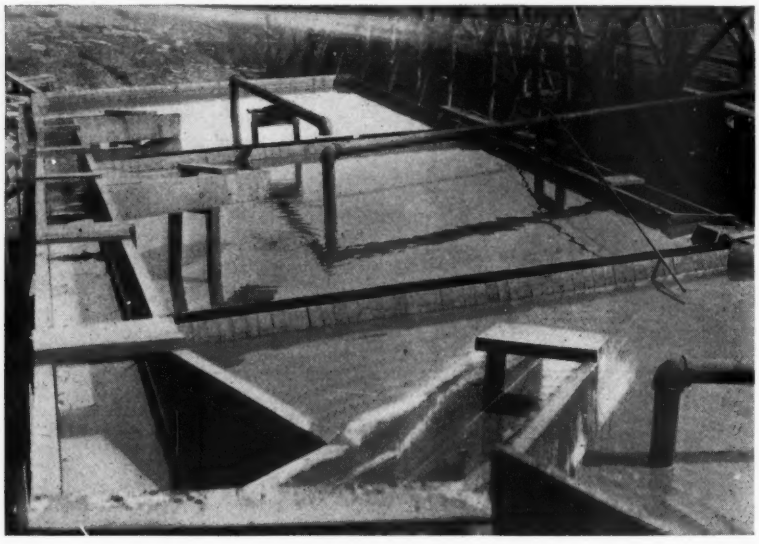
Mono-rail hoist reclaiming from Allen cones



Draining fine sands before passage through dryer

pump, while the material ¼ in. and over goes to a mud picker belt where all foreign substances are removed by hand. The remaining clean lumps on the belt are the finished pebble phosphate.

The sand from the centrifugal sand pump discharges into a set of inverted-pyramid settling tanks, where it discharges from one pyramid to another by water jets or siphons. The final sand is discharged into two 8-ft. Allen dewatering cones. It is interesting to note that throughout the entire operation water is added at every possible point to insure a clean product.



Flumes and settling tanks

Washing Plant

It is on this theory that the washing plant of the company was built—to eliminate dirty water at various points and to add clean water in its stead. The water at this plant is eliminated at three points: first at the drag conveyor, then at both hexagonal screens, while fresh water is added at the rolls, water jets and settling basins.

Again, it is interesting to note that instead of the customary cylindrical settling tank this company has employed inverted pyramids, claiming that they give a greater settling efficiency than the square box. From the large pyramids the sand is siphoned to the smaller ones, thus getting rid of the mud as much as possible.

Discharge from the Allen cones is picked up by a Brownhoist mono-rail crane, equipped with a grab-bucket, and transported to ground storage for drainage. From there it is again picked up by the same crane and transferred for passage through the dryers.

The main feature of this plant is the continuity in operation and the well-balanced flow sheet, which greatly improves the product obtained. It is understood by the writer that this company is producing a uniform product as to grade as well as a higher quality product, particularly securing a product that is much under in iron and alumina, the undesirable ingredient.

Design and Construction

The design and construction of the plant was made under the supervision of P. H. Haskell, who is manager in charge of the operations in the Tennessee district of the company. Mr. Haskell is a mining engineer of many years' experience in concentrating methods and in designing this plant it was his endeavor to install as many metallurgical principles as possible.

Storage buildings for fine phosphate sands

Small Magnesite Deposit in Pennsylvania

ABOUT the middle of the last century most of the epsom salts used in the United States was made in Baltimore from magnesite mined in Pennsylvania, but mining magnesite on a commercial scale in Pennsylvania ceased prior to 1860. The demand for magnesite on the Atlantic seaboard resulted last summer in an investigation of the possibility of working the Pennsylvania deposits profitably. In order that the Geological Survey might be informed concerning the recent developments, the deposits were examined by R. W. Stone.

These deposits are near Octoraro creek, on the Pennsylvania-Maryland state line. Some work has recently been done on a deposit just east of Goat Hill, in the southwestern part of Chester county. The magnesite occurs in the state line serpentine, and all the old pits recently reopened are within a few rods of the state boundary.

The work of re-excavating the pits, quarries, open cuts and a shaft that had become filled with dirt showed that the magnesite occurs in a fine network or stockwork of small veins, most of them less than 1 in. thick. There seem to be two principal systems of veins which cross at right angles; the veins of the north-south system stand nearly vertical, but those of the east-west system dip southward at a high angle. Two veins were uncovered, one about 14 in. wide and the other, found a few rods farther east in an open cut, about 12 in. wide. A thorough exploration, including the reopening and drainage of a shaft with underground drifts, failed to disclose any larger veins.

The development work completed last fall shows that the quantity of magnesite available close to the surface is very small and that many tons of waste would have to be handled to produce a single ton of MgO.

Editorial Comment

Getting Back to Normal

There are many signs of "normalcy" other than those developed in detail by various banker-publicists. We are back to the old days where beating down prices is a favorite indoor sport, back to the days where, in spite of trade association fellowship, you can't quite be sure what your brother producer will do to get business. In some cases the shoe is now on the other foot and we are witnessing combinations of purchasers making fair game of the producers. Producers of even such an essential highway building material as portland cement are being reminded that there is a substitute in the form of "black base" roads. It's a great game if you can figure out just how far the other fellow will carry the bluff; it's "normalcy"; it's old times with only a few new trimmings.

Activities of Trade Ass'ns

Elsewhere in this issue is a synopsis of the correspondence exchanged between Secretary Hoover of the Department of Commerce and Attorney-General Daugherty of the Department of Justice relative to the *legitimate activities* of trade associations. In view of the abuses made by some trade associations of certain activities, such as uniform cost-keeping, Mr. Daugherty's stand is remarkably liberal and, according to professional trade association secretaries, will permit practically all activities really conscientious trade associations executives have hitherto indulged in.

Naturally the attorney-general did not commit himself to any great extent in setting the legal limits of the activities outlined, and the sum and substance of the matter is just where it was before in the minds of intelligent business men. The Department of Justice cares very little about the means employed, but it is very much concerned in the ends attained. The proof of violation of the Sherman law is not the various steps by which the violation is effected, if it is effected, but the raising and maintaining of excessive prices—the limitation of fair competition—by whatever means that end is effected. Even the "open-price policy" as relating to past transactions, with certain limitations, is looked upon as in itself legitimate, although in the recent Supreme Court decision it was shown to be a ready means of violating the Sherman law in at least one instance. The main point made by Mr. Hoover evidently is that all such activities must be in the open and for honest purposes.

We believe that the adoption of the "Hoover principles" will in no way detract from the usefulness of trade associations, but will eventually increase their usefulness, not alone to their members, but to industry and to the general public as a whole, by thus recognizing officially their quasi-governmental nature and importance.

Building-Material Freight Rates

A very illuminating analysis of railway freight tonnage in the year 1920 has been made. Hitherto rather extravagant statements, such as that 50 per cent of the freight moved by the railways was building materials, have been freely circulated. It seems, as a matter of fact, that the tonnage of building materials moved in 1920 was only 55 per cent of the total tonnage of coal and coke alone! In other words, the coal and coke traffic is of twice the tonnage importance of building materials, and probably of even greater importance as a revenue producer.

This may be interpreted in many ways. To us it seems as if these statistics emphasize the great volume of building-material products which must move from their sources to the points of consumption by other means than the railways. A short time ago we made a rough estimate that the total tonnage of rock products annually produced was approximately equal to the annual production of bituminous coal, which constitutes the major part of the coal traffic. We believe that is a conservative estimate. The conclusion is, therefore, that the railways move only about half the tonnage of building materials that the country produces.

This is not difficult to explain. Most building material traffic, with the exception of steel and lumber, is comparatively short-haul business, while most of the coal traffic is long-haul business. The coal industry is concentrated in a few localities which serve large territories, while the building-material industry, with some few exceptions, is very much localized.

In other words, the railways are bound to carry coal at any rates they may have in force, but they have lost, and will continue to lose, a vast tonnage of building materials if present rates are persisted in. Of course 1920 was not a good year for such statistical purposes, for the railways refused other business in order to move coal, but probably since then the subsequent increases in freight rates have tended to divert more building material to other transportation channels, rather than less.

Incidentally, the future development of coal traffic by the railways is threatened by a governmentally organized program for widespread development of our hydro-electric power possibilities. So, if there are far-sighted business men among the railway executives it is hardly conceivable that they will longer neglect to make some attempt to recover at least a part of the building-material tonnage they are now ignoring.

Accident Prevention

Cut Cement Plant Accidents 75 Per Cent in 1921

DURING the past year, writes H. G. Jacobson, manager of the Bureau of Accident Prevention, Portland Cement Association, in the February issue of *National Safety News* this bureau has conducted safety campaigns at a number of its member plants in the form of no-accident months. The purpose was to prove that, taking the plants in their present generally well guarded condition, about 75 per cent of the accidents can be prevented by applying more efficient methods for selling the proposition to the men.

Thirty-nine plants during various months of the year conducted these no-accident month campaigns with the result that, in comparison with the corresponding month of the previous year with approximately the same number of men employed in these months, the number of accidents was reduced from 155 to 45, or 70.9 per cent; days lost were reduced from 2,205 to 504, or 77.1 per cent; deaths were reduced from 4 to 1, or 75 per cent. In no case was the cost of conducting any one of these campaigns more than $100, and in most cases the cost was less than $50.

The most gratifying result is not that it has been possible to reduce lost time more than 75 per cent during the drives, but that the interest in safety has been continued. Two plants are still fighting for the championship, neither having lost a single day in half a year. The performance of one of these plants is remarkable. During the first half of 1921 there were 45 accidents, with 442 days lost at this plant, and in the last half there was not a single accident causing loss of time.

Eight plants belonging to one company went through a campaign with the following results:

	Lost time accidents.	Days lost.	Days lost per 1000 man-days.
October, 1920	32	372	6.9
October, 1921	5	53	1.2
Reduction	84%	85%	

Five of the eight plants of this company did not have a single accident during the month of the drive.

In planning these campaigns it was decided to adhere strictly to business methods without attempting any spectacular stunts or giving prizes of any kind. There was a slight variation of methods in a few campaigns, but in the main the same general principle was followed.

With the idea of selling the proposition to the workmen the campaigns were announced by individually addressed letters from the plant superintendent to each workman a week or so before the beginning of the month. These letters were multigraphed, filled in with the name of the employe and signed in pen and ink by the superintendent.

After all the workmen had received letters the real advertising campaign began. Bulletins made up for the particular campaign were changed daily. As the month progressed the employes were continually kept advised about the standing of the various departments by tally sheets of various designs.

There has not been a single case where we have had reason to blame the men for being unwilling to deliver the goods. We have had accidents during some of the campaigns and we expected them, but we have never had an accident where the injured man felt much worse than those whose hope of establishing a record was blasted.

Do You Want to Have
ANY OF YOUR MEN CRIPPLED?

A workman scratched his little finger, but didn't report for first aid until three days later. Results: Blood poisoning, a good worker lost from his job for months, and a big hospital and compensation bill for his employer.

Infection cases are not unusual. Statistics prove that 10 to 15 per cent of all personal injuries in the average plant are seriously complicated by wound infection.

PREVENT ACCIDENTS—FORESTALL CLAIMS!

The accident prevention service offered to you through the National Safety Council has helped others to reduce accidents 75 per cent. This service is prepared from the combined accident experience of 3,500 members representing the progressive industrial concerns in America.

A single accident like blood poisoning in your plant would cost you more than membership in the National Safety Council for the next 20 years.

Write today for details.

National Safety Council
Co-operative Non-commercial
168 North Michigan Avenue, Chicago

Reduced Finger Loss

IN reporting a reduction of 66 per cent in average lost time and more than 60 per cent in accidents for the past year, the safety engineer of the Simmons Co., Kenosha, Wis., the figures show that while "46 fingers were lost in 1919," only 5 were cut off in 1921. This is not so grewsome as it sounds and bespeaks the increasing care being taken, mainly by carefully trained employes.

Cement Company Reduces Accidents

THE safety inspector of a large portland cement company has supplied *Safety Engineering* with the following brief story of the good results of a recent educational campaign in his plant:

"In the plant in which I am safety inspector we have an average of 300 men employed all the time. The machinery is completely guarded with angle iron and wire mesh screen, admitted by state inspectors and insurance companies to be guarded as well as if not better than any other plant in the state. Still we have had accidents, from smashed hands and feet to neglected cuts, and during the year two fatalities. On looking into the cause of all accidents we found that many of them were due to gross carelessness. The question arose: What could we do?

"Up to the end of September, 1921, we averaged 14 accidents a month; in one month we had no less than 29 accidents. On the first of October we inaugurated an educational campaign by writing an individual letter to each employe calling his attention to the need of carefulness, and posting large bulletins in conspicuous places throughout the plant, on the same subject.

"The accident record for October was reduced to five, a substantial reduction, but in our mind not enough. Beginning on the first of November we had large bulletins printed with a heading, 'No accidents in November,' in 4-in. letters, and a different slogan every day; 25 of those bulletins were posted every morning on bulletin boards in conspicuous places throughout the plant. We also had a calendar printed for November, the upper part divided into spaces naming the different departments in the plant. The days in which there were no accidents we crossed out. Should there be an accident it was charged to the department in which it occurred.

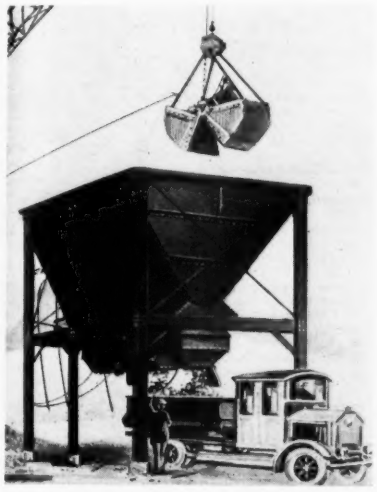
"We have kept up this system during December and I am glad to say that up to date (December 21) we have not had a single lost-time accident. The department calendar seems to create a rivalry—I might say ambition—among the men to have a clean record at the end of the month.

"This educational campaign seems to be what is needed, and I would earnestly urge that this or a similar system be tried out in any concern which has the same problem."

New Machinery and Equipment

All Steel Storage Bin and Adjustable Measuring Batcher

IT has been the contractor's experience, contends the Blaw-Knox Co., Pittsburgh, Pa., that, when the job is finished, the wooden bin is done for, whereas with the steel bin he has a permanent bin, varying the capacity in accordance with the size of the job. This bin, declares the manufacturer, is easily set up and taken down.



All-steel storage bin combined with adjustable batcher

The standard units will give a storage capacity of from 15 to 100 tons and larger and is of the height to get service from a portable crane and clamshell bucket, with sufficient clearance for any truck body. It can be used in connection with all methods of handling materials, including trucks, industrial tracks, tractors, trailers, etc.

Combined with this steel bin is the adjustable batcher, or measuring hopper. It is a steel measuring device located beneath the bin and includes the bin gate for the bottom of the storage bin. When the bin gate is closed, the material in the batcher is struck off at the same time, suspending the right volume in the batcher.

With the batchers filled up and the bin gate closed, one operator, it is claimed, can dump three or four batchers at once, thus loading a four compartment truck in less than 10 sec.

This batcher consists of two parts, a top cone and a lower section, the top cone moving within the lower section. It is adjustable to volume of material without the use of extra parts, and when calibrated for such volume, will stay put. It can be attached to any wood or to any steel bin.

By the use of lock bolts the engineer or contractor can seal the mechanism so that no change can be made without consent, thus eliminating the need for the supervision of a superintendent or inspector at the bin.

The batcher, the company states, is made in two general sizes, one for sand and one for stone.

Developments in Excavator Cranes

FOR the standard "P. & H." 205 and 206 excavator crane the manufacturers, the Pawling & Harnischfeger Co., Milwaukee, Wis., announce a new shovel attachment which can be substituted for the crane boom, thus making a complete gasoline shovel having a real crowding action.

The dipper is of ½ yd. capacity; one man controls all movement of the machine as well as that of the boom and bucket.

For these two types a skimmer boom was developed which can be used in place of the standard boom; a bucket slides along the boom under the operator's control.

Portable Reciprocating Feeder for Material Handling

FOR taking care of materials received in hopper-bottom cars, the Weller Manufacturing Co., Chicago, announces that it has placed on the market a portable reciprocating feeder.

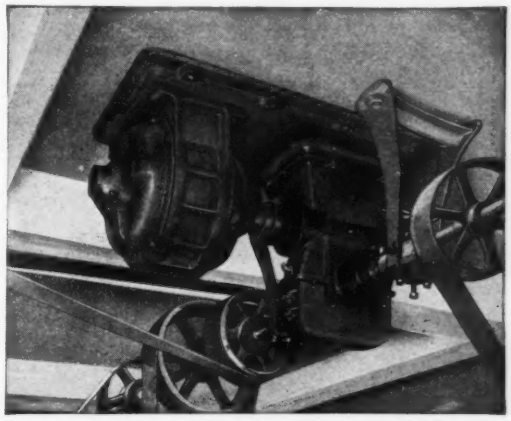
This feeder is said to eliminate the digging of pits, and cars can be unloaded at a point most convenient to where the materials are required. It operates above the track and handles sand, stone, gravel, etc., saving the labor of several men. One man can easily handle the job of unloading and delivering the materials to any style of loader or elevator. It is mounted on roller bearings and can be easily slipped under the car. A motor or engine is mounted on a platform, making it a complete unit. There are no complicated parts to get out of order.

Enclosed Worm-Gear Drive for Overhead Shafting

THE application of an enclosed worm-gear drive to overhead line shafting is shown in the accompanying illustration as developed by the Cleveland Worm and Gear Co., Cleveland, Ohio. Several advantages claimed by the company include smooth, uniform transmission of power, with practically no noise or vibration; the ability of the worm gear to accomplish large ratios of reduction makes it possible to use smaller higher speed motors even for shafts running at low speeds; a high mechanical and electrical efficiency, with normal lineshaft ratios runs from 93 to 97 per cent; the use of a higher speed motor increases this electrical efficiency and improves the power factor.

The drives are mounted on ball bearings throughout, the lower half of the housing forming an oil bath which provides for the lubrication of the whole unit. In some cases the motor and drive are mounted on a common bedplate, but where steel construction of sufficient strength is used it is possible to mount the unit directly on the steel work.

The arrangement is compact, enclosed in a dust-proof housing, and there is no fluctuations in speed, due to slip or throw, etc. The safety and cleanliness of these drives are of particular value in plants where chemicals or abrasive dust are detrimental to belting. The gearing used is identical with that of the rear axle drives of motor trucks, and all unit stresses are kept at a minmum to assure long life and uninterrupted service.



Application of an enclosed worm-gear drive to overhead line shafting

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.00	1.00	1.00	1.00	.....
Buffalo, N. Y.	1.50	per net ton all sizes—Winter prices from stock				
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	.....	.....	1.75	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.	1.50 per net ton, all sizes					
Eastern Penna.	.75	1.50	1.50	1.50	1.50	1.50
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	1.25
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.35	1.35	.....
Bettendorf, Ia.	All sizes, 2.00 cu. yd. f.o.b. quarry					
Buffalo, Iowa	1.00	1.50	1.40	1.30	1.35	1.35
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.35	1.10	1.10
Greencastle, Ind.	1.25	1.20	1.10	1.10	1.10	1.10
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	.....
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.35	1.25	1.35	1.15	1.10	1.10
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montreal, Canada	.85	1.20	1.10	1.05	1.00	.....
Montrose, Ia.	1.35	1.50	1.60	1.55	1.50	.....
River Rouge, Mich.	1.15	1.15	1.15	1.15	1.15	1.10
Sheboygan, Wis.	1.00	1.10	1.10	1.05	1.10	.....
Southern Illinois	1.40	1.35	1.35	1.35	1.35	.....
Stolle, Ill. (I. C. R. R.)	1.55	1.55	1.55	1.30@1.35	1.50	1.50
Stone City, Iowa	.75	.....	1.40	1.35	1.30	.....
Toledo, Ohio	1.84	1.99	1.99	1.99	1.84	1.84
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
	Prices include 90c freight					
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
Waukesha, Wis.	all sizes 1.10 per ton					
SOUTHERN:						
Cartersville, Ga.	.....	2.00	2.00	1.40	1.40	1.40
Chickamauga, Tenn.	.80@1.00	.80@1.00	.....	.75@1.00	.65@1.00	.60@ .80
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
Ft. Springs, W. Va.	1.20	1.50	1.75	1.60	1.45	1.30
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Gainesville, Ga.	1.00	1.25	1.25	1.25	1.25	1.25
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.10	1.25	1.25	1.25	1.25	1.25
Portland, Ga.	.60@1.00		(All other sizes 1.00@1.25)			
Shephard, Tenn.	1.00@1.25	1.00@1.25	1.00@1.25	.75@1.00	.75@1.00	.....
WESTERN:						
Atchison, Kans.	.50	2.10 (Rip-rap.	2.10	2.10 1.80 per ton)	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.65	1.60	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.80	1.80	1.80	1.80	1.80

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2 20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	1.00	.....
Bound Brook, N. J.	2.30	2.50	2.20	1.90	.....	.....
Dresser Jct., Wis.	1.25	2.25	2.25	1.75	1.50	1.50
Duluth, Minn.	.75@1.00	2.25	1.90@2.00	1.50	1.35@1.50	1.35@1.50
E. Summit, N. J.	2.30	2.60	2.40	2.00	2.35	.....
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	.80	1.60	1.60	1.40	1.40	1.40
Eastern Penna.	1.25	1.85	1.75	1.55	1.35	1.45
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	60@ .80	1.60@1.75	1.50	1.25	1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.50	1.50	1.50
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.10	2.00	1.80	1.75	.....
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Dell Rapids, S. D.—Granite	.75	1.85	1.75	1.70	1.70	.....
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	1.00	1.65	1.65	1.40	1.40	1.40
Eastern Penna.—Quartzite	.90	1.20	1.20	1.20	1.30	1.30
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@3.75	.....	2.00@2.35	2.20@2.75	.....	1.25@1.75
Red Granite, Wis.	1.35	1.40	1.30	1.50	1.20	.....
Sioux Falls, S. D.—Granite	.75	1.85	1.75	1.70	1.70	.....
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	.....
Utley, Wis.—Red Granite	1.35	1.40	1.30	.....	1.20	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk 3.00

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$—70% thru 100 mesh; sacks 4.50; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Osborne, Pa.—45% thru 200 mesh, 60% 100 mesh, 100% thru 20 mesh; 4.50 sacks; bulk 3.00

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Waltord, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 5.00—cloth, 5.25; bulk 3.50

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 2-4% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk 3.75

CENTRAL:

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—90% thru 100 mesh 7.75

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Buffalo, Ia.—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_2$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh 1.00

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh 2.00

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh 1.45

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Marblehead, O.—Analysis, 33.42% $CaCO_3$, 4.2% $MgCO_3$—52.4% thru 100 mesh, 59% thru 50 mesh, 100% thru 10 mesh; sacks, 4.50; bulk 3.00

Limestone screenings; bulk 1.50

Milltown, Ind. — Analysis, 91.59% $CaCO_3$, 4.87% $MgCO_3$—33.6% thru 100 mesh, 40% thru 50 mesh ..... 1.25@1.65

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$ — 60% thru 100 mesh, all thru 10 mesh 1.25

Montrose, Ia.—50% thru 100 mesh 1.35

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh ..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—80% thru 100 mesh ..... 3.25@5.00

50% thru 50 mesh 2.00

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ½-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 100 mesh ..... .75

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Whitehill, Ill. — Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$—90% thru 100 mesh	5.00
90% thru 50 mesh	1.40
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk	4.25
SOUTHERN:	
Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk	4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh	4.75
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh	2.00
90% thru 4 mesh	1.50
Cartersville, Ga.—Analysis, all thru 10 mesh	1.75@2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—50% thru 100 mesh	3.00
Grevania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh	2.50
Hot Springs, N. C.—Agricultural limestone; sacks, 4.25; bulk	3.00
Knoxville, Tenn.—Pulverized	2.50
90% thru 100 mesh	2.00
90% thru 50 mesh	1.50
Ladds, Ga.—90% thru 50 mesh	2.00
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk	3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$—80% thru 100 mesh	3.00
All thru 10 mesh	2.50
80% thru 200 mesh	4.50
Paper bags, $1.50 extra per ton; burlap, $1.00 extra per ton.	
Maxwell, Va.	2.50
Ocala, Fla. — Analysis, 98% $CaCO_3$—75% thru 200 mesh	4.50
WESTERN:	
Colton, Calif.—Analysis, 90.95% $CaCO_3$, 2-3% $MgCO_3$—all thru 14 mesh—bulk Sacks, 15c extra, returnable.	4.00
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh	.50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk	1.80
Terminous, Calif. — Analysis, 97.3% $CaCO_3$, .04% $MgCO_3$—65% thru 200 mesh, 90% thru 100 mesh, 95% thru 80 mesh, 100% thru 50 mesh; sacks, 5.00; bulk	4.50
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:	
Baltimore, Md.	2.25@2.75
Berkley Springs, W. Va.	2.00@2.25
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.	5.00@7.00
Hancock, Md.—Damp	2.50@3.50
Klondike and Pacific, Mo.	2.00@2.50
Mapleton, Pa.	2.25@2.50
Massillon, Ohio	3.00
Millington, Ill.	1.75
Montoursville, Pa.—Green, washed	2.00
Oregon, Ill.—Large contracts	1.75
Ottawa, Ill.	1.25@1.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.75
Round Top, Md.—(washed-screened)	1.25
St. Mary's, Pa.—Unwashed	2.25
Utica, Ill.	1.25@1.75
Zanesville, Ohio	2.00@2.50
FOUNDRY SAND:	
Albany, N. Y.—Sand blast	4.00
Molding fine, coarse and brass	2.25@2.50
Allentown, Pa.—Core and molding fine	1.50@1.75
Arenzville, Ill.—Molding fine	1.40@1.60
Beach City, O. — Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.25
Core	1.25@1.50
Columbus, O.—Core	.30@1.25
Sand blast	4.50@5.00
Furnace Lining	2.00
Molding fine	2.00@2.75
Molding coarse	1.75@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge and So. Heights, Pa.		1.15	1.15	1.15	.70	.70
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Buffalo, N. Y.	1.10	.95	.85		.85	
Erie, Pa.		1.00		1.15		1.25
Farmingdale, N. J.	.48	.48	1.30	1.30	1.30	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.50	1.35	1.25
Ludlow, Mass.	.75•	.75•	1.70		1.50•	1.50•
Philadelphia, Pa.	.75	.75		1.40	1.25	
Pittsburgh, Pa.		1.30	1.30	1.30	.85	.85
Portland, Maine		.50	1.75		1.35	1.35
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.75	.75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.40	.40				.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.50			.50	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio		.75@1.25	.75@1.25	.75@1.25	.75@1.25	.75@1.25
Des Moines, Ia.		.40@ .60	.40	1.30	1.50	1.50
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.40		1.25		.90	
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.85		.75
Greenville, Mechanicsburg, O.	.60	.50	.50	.50	.60	.60
Hamilton, Ohio		.85			.85	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.	.50	.50			.70	.70
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Le Mars, and Doon, Ia.		.90		1.80		
Libertyville, Ill.		.70		.70	.70	
Mankato, Minn.	.50	.40	.75@1.50	.75@1.50	.75@1.50	.75@1.40
Mason City, Ia.		.55	1.80	1.55	1.55	1.55
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.50	.50	1.50	1.35	1.25	1.25
Moline, Ill.	.60@1.00	.60@1.00	1.60	1.60	1.60	1.60
Riton, Wis.		.60		.70	.70	.70
St. Louis, Mo., f. o. b. cars	1.20	1.52½	1.67½	1.47½	1.42½	1.42½
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.65@ .75	.65	.75	.75	.75
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	.60		All other sizes, .70 per ton			
Winona, Minn.	.60	.50	1.75	1.50	1.25	1.25
SOUTHERN:						
Alexandria, La.	.60@ .80	.50@ .75			.85@1.50	1.20@1.50
Birmingham, Ala.	1.48		all gravel—1.88			
Charleston, W. Va.			(Sand, 1.40@1.50; gravel, 1.50			
Estelle Springs, Tenn.	1.15	1.10			1.00	.85
Ft. Worth, Tex.		2.00		2.00		2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00@1.15	1.00@1.15		2.12	1.92	1.74
Lake Weir, Fla.		.75				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.10	1.10		1.30		.90
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	.90@1.25	1.00@1.20	Washed gravel, all sizes, 1.75			
Roseland, La.	.25		.85			
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Jedburg, Mo.	.70	1.20	.95	.75	.75	.70
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Los Angeles, Calif.		.90	1.50	1.50	1.25	1.25
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10•	.90•			1.25•	
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50•	1.50•	2.00•	1.50•		1.50•
Yutan, Neb.	.40		Bank run .40			

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)		1.05		1.00		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.			Washed gravel .66			
Estelle Springs, Tenn.						.85
Fishers, N. Y.	.50@ .60			.50@ .60		
Hamilton, O.			.45 per cu. yd. in pit			
Hartford, Conn.		1.00•				
Hersey, Mich.				.50	.50	
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Janesville, Wis.		.65			.65@ .75	
Oxford, Mich.				.65	.65	
Pine Bluff, Ark.			Road gravel .60			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.57½			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.			.70	.70	.70	.70
York, Pa.		.95@1.20		(crushed rock sand)		

•Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.10	2.50	1.35	1.35	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.90	1.50	1.00	1.00	1.00	1.00
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton, O.	2.05	1.75	Other grades 1.55½				
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.93	2.30	2.49	2.49	2.49	2.30	2.30
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.60	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.			7.00					3.50
Bellefonte, Pa.			8.00	9.00	8.00		7.50	
Berkley, R. I.			14.00					2.50
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00•
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.50	
Paxtang and LeMoyne, Pa.					5.00		4.50@5.00	
Rockland, Maine						8.00		
Union Bridge, Md.			13.00		5.50			
West Rutland, Vt.	13.50	12.25	7.50@12.25	14.00			11.00	3.50
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		9.50	9.50@10.50	10.50@12.50			8.50	2.35
CENTRAL:								
Delaware, Ohio	10.50	9.00	8.50	9.50			8.00	1.40
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§	8.50	8.50		6.75	8.75		
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70•
Knowles and Valders, Wis.			12.50		5.00	9.00		
Marblehead, Ohio	10.50	9.00	7.75	11.00	6.75		8.00	1.50•
Mitchell, Ind.		11.00	11.00	11.00	9.50		8.50	1.45
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50				2.25	9.25		
Woodville, O. (dlrs.' price)	10.50a	8.00a	8.00a	9.00a	8.25		8.00	1.60
SOUTHERN:								
El Paso, Tex.							12.50	
Knoxville, Tenn.	11.00	9.50	9.50				7.50	1.30
Ocala and Zuber, Fla.	12.00	11.00	11.00			10.00		1.50
Sherwood, Tenn	11.00	9.50			7.50		7.50	
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.					12.00	15.00		2.00c
Los Angeles, Calif.			15.00‡				16.00	
San Francisco, Calif.	22.00		15.00@16.00	25.00			16.00	2.15•
Tehachapi, Calif.						15.00	13.00	2.00

‡100-lb. sacks; •180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Stone sawing	1.50
Traction	1.00
Brass molding	2.75
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Molding coarse	1.50@1.75
Brass molding	1.75
Dunbar, Pa.—Traction, damp	2.35
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Falls Creek, Pa.—Glass sand	2.50
Furnace lining, traction and molding coarse and fine, and core	2.00
Sand blast	3.50
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.25@4.25
Traction sand	.50
Franklin, Pa., and Utica, Pa.—Traction	2.00
Brass molding	2.75
Core	1.25@2.00
Molding fine	2.75
Molding coarse	2.50
Furnace lining	2.50
Greenville, Ill.—Molding coarse	1.50@1.70
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay	.90@1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75
Klondike, Pacific and Gray Summit, Mo.—Molding fine and core	1.75@2.25
Mapleton, Pa.—Core, dry	2.50
Furnace lining, damp	2.00
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Glass sand	2.25@2.50
Massillon, O.—Traction, molding fine and coarse, core, and furnace lining	2.50
Glass sand	3.00
Michigan City, Ind.—Core, traction	.30@ .40
Mineral Ridge, Ohio—Core, furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction (green)	2.00
Montoursville, Pa.—Core	1.25@1.40
Traction	1.00@1.25
Brass molding	1.50
New Lexington, O.—Molding fine	2.75
Molding coarse	2.50
Oregon, Ill.—Core, glass sand	.75
Furnace lining	.75
Molding coarse and fine	.75
Traction	.75
Ottawa, Ill.—Core, roofing sand	1.50
Sand blast, stone sawing	4.00
Ottawa, Minn.—Core	1.00@1.50
Glass, molding coarse, stone sawing (all crude silica)	1.00@1.50

Miscellaneous Sands

(Continued)

Pelzer, S. C.—Glass sand (carload lots only)	.70
Rockwood, Mich.—Core, damp	2.50
Roofing	2.75
Sand blast	3.00
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	2.00
Furnace lining, m'ld'g fine and coarse	1.25
Core—green	1.75@2.00
Utica, Ill.—Core	.85@1.10
Glass sand	1.25@1.50
Furnace lining	.85@2.00
Molding fine and coarse	.85@1.25
Roofing sand	1.25
Sand blast	2.25@3.00
Stone sawing	1.25@2.25
Traction and brass molding	1.25
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.00
Traction (dry)	2.00
Zanesville, O.—Core, furnace lining, molding fine, traction	2.00
Molding coarse	1.75
Sand blast	4.50
Brass molding	2.00@2.25

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude Talc	3.50
Ground talc (20-50 mesh), bags	10.00
Cubes	50.00
Blanks, per lb.	.07
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh), including bags	7.50@10.00
Emeryville, N. Y.—150-200 mesh; bags	13.50
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Ground Talc (50-300 mesh)	13.50@15.50
Gordonsburg, Tenn.—B.P.L. 68%@72% 200 mesh)	4.50@6.00 13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@3.50
Ground talc (20-50 mesh), bags, 7.75; (150-200 mesh) bags	7.75@11.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50 (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 Mesh)	20.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.00@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags $1.00 extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton	
Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%@72%	4.50@6.00
Mt. Pleasant, Tenn.—Analysis, .70 B.P.L. (2000 lbs.)	7.00@7.50
Montpelier, Idaho—70% B.P.L.—Crude	5.00
Crushed 2-in. ring and dried	6.00
Paris, Idaho.—2,000 lb. mine run, B.P.L 70%	4.00
Wales, Tenn.—B.P.L. 70%	7.50
Per 2000-lb. Ton	
Barton, Fla.—Analysis, 50% to 65% B.P.L.	3.50@5.00
Centerville, Tenn.—B.P.L. 65%	6.50
B.P.L. 75% (brown rock)	12.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65@70%	5.00@6.50
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	18.00@20.00	10.00@14.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	35.00	12.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@32.50	20.00@25.00
Milwaukee, Wis.		20.00@26.50
Missouri river points — Different colors	20.00@25.00	20.00@25.00
Phillipsb'g, N. J.—Green stucco dash		9.00@15.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.		12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00	26.00@34.00
Bellow Falls, Vt.	18.00	25.00
Birmingham, Ala.	16.00	27.50@50.00
Bridgeport, Conn.	31.00	32.00
Carpenterville, N. J.	20.00	40.00@65.00
Easton, Pa.	16.00	40.00@60.00
Eau Claire, Wis.		30.00@50.00
Eugene, Ore.	25.00@27.00	35.00@75.00
Rochester, N. Y.	21.00	
Friesland, Wis.	25.00	
Houston, Tex.		19.50
Lockport, N. Y.	17.00	
Omaha, Nebr.	16.00@20.00	30.00@40.00
Piqua, O.	15.00	25.00@50.00
Phoenix, Ariz.	16.00	35.00@80.00
Portland, Ore.	23.75	45.00@75.00
Puyallup, Wash.	22.00	50.00@75.00
Rapid City, S. D.	20.00	30.00@60.00
St. Paul, Minn.	16.00	30.00@35.00
Salem, Ore.	25.00@30.00	35.00@75.00
Salt Lake City, Utah	16.00	35.00@40.00
Seattle, Wash.	18.00@22.00	35.00@75.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Walkersville, Ont.	30.00	36.00
Wauwatosa, Wis.	13.00@15.00	28.00@42.00
Winnipeg, Man., Can.	19.00	40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	9.00
Boston, Mass.	11.50@12.50
Brighton, N. Y.	14.25
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	12.50
Michigan City, Ind.	10.00
Milwaukee, Wis. (delivered at job)	13.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Rives Junction, Mich.	10.00
Redfield, Mass.	15.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	14.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton: Finishing	Hydrate per Ton: Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	.....
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	.....

	Lump per 180-lb. Barrel (net): Finishing	Lump per 180-lb. Barrel (net): Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.	.....	12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.40
Denver, Colo.	.....	2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	.70*
San Francisco, Calif.	.....	1.90
Seattle, Wash.	3.25	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Ia.	2.11
Cincinnati, Ohio	2.32
Cleveland, Ohio	2.26
Chicago, Ill.	1.94
Dallas, Tex.	2.65
Davenport, Ia.	2.06
Denver, Colo.	2.69
Detroit, Mich.	2.17
Duluth, Minn.	1.95
Indianapolis, Ind.	2.21
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.06@3.20
Milwaukee, Wis.	2.13
Minneapolis, Minn.	2.24
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.88
New York, N. Y. (includes bags)	2.35
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.02
Portland, Ore. (sacks 10c ea.)	3.05
St. Louis, Mo.	2.20
San Francisco, Calif. (sacks 10c ea.)	2.73
St. Paul, Minn.	2.24
Toledo, Ohio	2.20
Seattle, Wash. (incl. sacks, 10c ea.)	3.34
F. o. b. Seattle (including sacks)	3.50

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lbs. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10', 1850 lbs. Per M Sq. Ft.
Alabaster, Mich.	3.00	4.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Rapids, Kan.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	23.75	19.00	19.375	20.00	36.75
Douglas, Ariz.	.....	.....	5.00	13.00	.....	10.50@12.00	.....	.....	.....	12.50@13.50	.....	.....	.....
Eldorado, Okla.	.....	.....	.....	.....	10.00	10.50	10.00	.....	15.50	.....	27.20	29.30	39.55
Fort Dodge, Ia.	3.00	4.00	6.00	8.00@11.00	10.00	10.50	15.45@22.00	.....	25.80	20.00	19.375	20.00	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	4.00	6.00	8.00	10.00	10.00	18.50	.....	27.25	20.00	19.375	20.00	30.00
Gypsum, Ohio	3.00	4.00	6.00	8.00	10.00	10.00	19.25	7.50	27.95	19.00	19.375	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	.....	10.00	10.50	.....	.....	.....	11.00	.....	.....	.....
Loveland, Colo.	3.00	4.00	6.00	8.00	10.00	10.50	.....	.....	29.80	.....	.....	.....	40.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	28.25	21.00	19.375	20.00	30.00
Piedmont, S. D.	.....	.....	6.00	8.00	10.00	10.50	.....	.....	32.25	.....	27.97	31.04	41.18
Plasterco, Va.	4.00	.....	7.00	8.00	10.00	10.00	20.90	.....	29.90	19.00	21.375	22.00	.....
Southard, Okla.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	15.50	.....	26.20	28.70	30.00
Winnipeg, Man.	5.50	5.50	7.00	15.00	16.00	16.00	.....	.....	32.50	18.00	28.50	30.00	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

Morgan Sand and Gravel Co., Brooklyn, N. Y., has been incorporated at $25,000 by F. and W. Kopp, W. B. Nallen.

The Bradbury Marble Co., St. Louis, Mo., has been incorporated at $75,000, with Texas headquarters at Dallas, T. Mason, state agent.

The Rutland Marble Mfg. Co., Brandon, Vt., has been granted a capital stock increase from $3,000 to $125,000. M. A. Brown is president.

The R. M. Fraser Granite Co., Montpelier, Vt., has been incorporated at $50,000 by Robert M. Fraser, Walter J. Jellyman and Nina R. Fraser.

The Florida Gravel Co., Quincy, Fla., has been incorporated at $50,000 by C. F. Mullen, president; E. H. Thomas, vice-president and treasurer, and Y. L. Watson, secretary.

The Elliston Gravel Co., Bloomfield, Ind., has been incorporated at $25,000, to deal in sand and gravel. William Johnson, L. R. Henley and J. A. Schelienger are the directors.

The Wisconsin Limestone Co., Waukesha, Wis., has been incorporated at $65,000 by Henry G. Meigs, West Allis, Wis., president, and William S. Halladay, secretary, Waukesha, Wis.

The Florida Gravel Co. has been incorporated in Quincy, Fla., with a capital stock of $50,000, with C. F. Mullen, president; E. B. Thomas, treasurer, and Y. L. Watson, secretary.

The Appleton Sand and Gravel Co., Waupaca, Wis., has been incorporated at $25,000 by R. F. Whale, William Dressen, S. W. Johnson and Alfred Johnson to operate sand and gravel pits, crushed stone plant, etc.

Sand and Gravel

The Arrow Sand Co., Cincinnati, Ohio, has increased its capital stock from $150,000 to $200,000.

R. Young and C. B. Denton have under construction a $10,000 gravel plant in Newberg, Mo.

The Wheeling Sand and Gravel Co., Wheeling, W. Va., has acquired an established plant and will develop it.

The Central Sand and Gravel Co., Memphis, Tenn., has let the contract for installing a screening and washing plant and storage bins.

The Wabee Gravel Co., Milford, Ind., has filed papers showing an increase in capital stock from $50,000 to $100,000.

The Southern Sand and Gravel Co., of Shelby County Tennessee, has filed an amendment to its charter seeking to change its name to the Central Sand & Gravel Co.

The Louisiana Sand and Gravel Co., recently incorporated in Monroe, La., has elected T. E. Stephenson as president and C. C. Houston as secretary and treasurer.

Rock County Sand and Gravel Co., Milwaukee, Wis., has increased its stock from $75,000 to $100,000. It manufactures crushed stone and rock, sand, etc. Harry Evers is president, and Charles Schendel, secretary.

Kelley Island Lime and Transport Co. is constructing a new crusher plant at Lakeside. This plant will have a capacity of 1000 tons per hour. This will be one of the largest individual crushing plants in the country, and it will load a car of stone every 3 min.

The Western Indiana Gravel Co. will add another plant at Metropolis, Ill. This company operates plants at Terre Haute, Lafayette and Warsaw, Indiana. The plans for the new plant in Metropolis is to install oil engines as soon as they can be secured, the plant to have a capacity of about 80 cars per day.

The Rock Island Sand and Gravel Co., Rock Island, Ill., is working on an installation of a new screening plant with a capacity of about 1,000 yd. per day. The company exnects to have this plant in operation by the middle of April, which will place it in a position to supply contracts for cement, gravel and torpedo sand and building sand. The company is pumping its material with a suction dredge, elevating it into screens with a bucket and conveyor.

Long Beach, Calif.—Graham Brothers, dealers in sand and gravel, have three new units under construction. The new plant at East Long Beach has a large warehouse and storage bunkers of 12-car capacity; it is located on a two-acre track, with railroad siding. The plant at Harbor City will be the largest local sand pit ever attempted in this locality. It will have a 400-ft. elevator and storage for 1,000 yd. of sand with modern screening facilities. From one truck and a few teams in 1919 the company has enlarged its equipment to 30 trucks and 20 teams, and are operating both a steam shovel and gas shovel.

Cement

The San Antonio Portland Cement Co., San Antonio, Tex., has increased its capital stock from $250,000 to $300,000.

Chefoo, China—A cement company is being organized in Chefoo with a capital of Yen. 2,000,000. The promoters are a Japanese and a Chinese merchant.

Superior, Neb.—At the stockholders' meeting of the Nebraska Cement Co., all the old officers were re-elected, and report made that the production of the plant had been up to normal.

Tsing King, China—Wei Yien-ping and others have organized the Tsing King Cement Mfg. Co. at Tsing King, Chihli province, and requested the Ministry of Agriculture and Commerce for registration.

The Cape Girardeau Portland Cement Co., of which Charles L. Harris, Cape Girardeau, Mo., is president, will spend about $110,000 in remodeling and improving the plant, and will later build a concrete administration building.

Youngstown, Ohio—The Bessemer Limestone and Cement Co. has already sold 200,000 bbl. of cement for 1922 delivery, or one-sixth of its maximum output. An official says that, from present indications, 80 per cent of the total capacity will soon be sold for the year. The company has contracted to supply the flux-stone for the blast furnace of the Trumbull-Cliffs furnace at Warren, over the first six months of the year, at the rate of 2,000 tons weekly.

Davenport, Iowa—Seventy-five stockholders attended the annual meeting of the Linwood Stone & Cement Co. at the Chamber of Commerce recently. The secretary's report showed that the company had enjoyed a good business year during 1921 notwithstanding the prevailing unsettled conditions. President A. E. Horst, Vice-President A. E. Carroll and Secretary-Treasurer J. F. Schroeder gave short talks. Directors were elected as follows: A. E. Horst, J. F. Schroeder, A. E. Carroll, Otto Hill, Dr. Frank Neufeld, A. C. Klindt, C. C. Hagerman of Muscatine, E. R. Schroeder and R. J. Walsh. The directors will meet soon to select officers.

Quarries

The Burrus Granite Co., Burlington, Ia., has increased its capital stock to $250,000.

The Stonecreet Corporation, Pittsburgh, Pa., Charles B. Lawton, manager, is about to build a two-story plant near Cheswick, Pa.

The Appalachian Marble Co., Knoxville, Tenn., has begun work on an addition to its plant to cost $100,000.

Bedford, Ind.—Papers showing an increase in capital stock from $150,000 to $200,000 have been filed by the Imperial Stone Co.

The Wilson Creek Quarry Co. of Hutbur, N. C., of which A. L. Berry is president, will develop quarries with a daily output of 20 cars.

Pike County, Ark.—An effort is being made to resume operations on the Pike County, Ark., rock asphalt deposits for road work. The high price of cement is aiding the project. A number of years ago this asphalt was extensively mined and some of the best of Little Rock's older streets are paved with the material.

Montpelier, Vt.—Articles of association have been filed by the Bonazzi & Tonelli Quarry Co., Inc., Montpelier, capital $20,000. The incorporators are Ettore Bonazzi, E. M. Harvey, Rose Bonazzi, and Rinaldo Tonelli. Purchase of the John Benzie quarry in Groton has been made and the plant of Mr. Tonelli at Groton is included in the corporation. Mr. Bonazzi is owner of the business conducted under the name of Bonazzi & Bonazzi.

Lime

The Kimballton Lime Co., Shawsville, Va., will enlarge its plant by the addition of two kilns, and will replace the plant structure by a large steel two-story building.

G. L. Maas, Black Creek, Wis., has announced that the Outagamie Limestone Co., of that city, dealers in high-test ground limestone and crushed stone, has purchased the plant formerly owned by him.

The Koury Calcium Co., McGregor, Tex., has been organized with W. V. Hanover as secretary and will develop 60 acres of lime deposits, putting in a hydrated lime plant with four kilns of 25 tons each per day.

McGregor, Texas—The Koury Calcium Co., organized with W. V. Hanover, secretary, will develop 60 acres of lime deposits and install a plant for manufacturing hydrated lime; capacity, 100 tons daily.

San Francisco—Extensive lime deposits at Jenkins Hill, on the Yosemite Valley railroad, have been leased for a period of years by Messrs. Van Hook and McMillan, of San Francisco. A large distribution plant is planned for Merced, Calif., not far distant from these deposits.

Danbury, Conn.—The New England Lime Co. has let the contract for the erection of three all-steel buildings, to replace those of its plant destroyed by fire at Boardman's Bridge a few weeks ago. The buildings will include one 300 by 30 ft., another 200 by 40 ft., and the third, 75 by 25 ft., of one story each. These three, according to President C. E. Grinning, will be erected at once, and several others will be built later.

Dealers

The Staunton Lime Products Co., Staunton, Va., of which N. C. Taylor is manager, has increased its capital stock to $50,000.

The Tri-State Monument Co. has been incorporated in La Crosse, Wis., with a capital of $25,000, by Elvin L. Halmrast and others.

Standard Concrete Pipe Co., Manhattan, N. Y., has been incorporated at $5,000 by H. S. Hart, A. H. Jackson. Attorney E. Norton, 2 Rector Street.

The American Concrete Ties and Products Co., of which John E. Springer, 426 Law Bldg., Baltimore, Md., is president, is looking for a site for its plant.

Kelly Concrete Products Co., 317 Guaranty Trust Bldg., Atlantic City, N. J., has been incorporated at $125,000 to manufacture concrete blocks, brick, etc.

The Midwest Building Materials Co. has been incorporated in Tulsa, Okla., at $25,000, by Edwin B. Quick, Charles A. Sanderson and R. Wesley Sanderson.

The Dixie Coal, Lime and Clay Products Co., Chattanooga, Tenn., has purchased 150 acres of lime rock at Graysville, Tenn., and will develop it.

The Silver Springs Building Supply Co. has been incorporated in Silver Springs, Md., at $150,000, by James H. Cissel, E. Brooke Lee and Frank L. Hewitt.

The American Concrete Tile and Products Co. has been incorporated at $250,000 in Baltimore, Md., by John W. Ritter, John E. Springer and John T. Davis.

The Logan Concrete Block Co. has been incorporated in Logan, W. Va., with a capital stock of $10,000, by G. Folkner, R. E. Matticks and John Claypool.

Castle Cement Building Products Co., cement, $75,000; Harry M. Venger, New Kensington, Pa.; William Brauner, H. B. Willoghby, Pittsburgh. (Colonial Charter Co.)

The Buckeye Cement Block and Supply Co., Girard, Ohio, has been incorporated at $15,000 by Peter Yaklevich, John Yaklevich, John Nimanich, John Juvancie, Frank Lisler, Jr.

John W. Brooks, McAlister, Okla., has leased a large tract of land at Idabel, Okla., and will

install equipment for developing sand, gravel and other road-building equipment.

The **Carroll Chain Co.**, Columbus, Ohio, is specializing on steam-shovel loading chains designed to meet the requirements of open-cut mining. Daniel Carroll is president and general manager.

E. D. Winkworth, president of the Semet-Solvay Co., has been elected president of the Solvay Process Co., succeeding E. L. Pierce, who resigned on Jan. 31. Mr. Pierce also resigned his place as one of the vice-presidents of the Allied Chemical Co.

The **Hercules Powder Co.**, Wilmington, Del., announce a reduction of $7.50 per 1,000 feet in the list price of Cordeau Bickford detonating fuse, effective February 1. This applies to the No. 6 plain, No. 6 countered, and No. 6 double countered grades. There is also a reduction in price of Cordeau crimpers and straight unions for connecting ordinary Cordeau Bickford.

The **Beaumont Mfg. Co.**, Philadelphia, desiring to give more attention to its expanding engineering business, recently disposed of its crusher, elevator, screen and road-building machinery lines to H. J. Kaltenthaler, 236 Cherry Street, Philadelphia, who will hereafter manufacture and sell this equipment. W. T. Ruth, former manager of this department for the Beaumont Mfg. Co., is now connected with Mr. Kaltenthaler in the same capacity. Mr. Ruth was for many years with the Good Roads Machinery Co. as general superintendent and chief engineer.

Personal

A. P. McCallie has resigned from the Kelley Island Lime and Transport Co. Mr. McCallie is now the general agent for the Blue Diamond Mortar plants, patented by W. C. Hay of Los Angeles, Calif.

Obituary

George C. Sykes, secretary of the Lehigh Portland Cement Co., Allentown, Pa., died at his home in that city recently, at the age of 49 years.

William C. Sargent, for 22 years secretary and also a director of the Chain Belt Co., Milwaukee, died suddenly on February 5 as a result of heart failure. He was 73 years of age and had been in ill health for several years. Mr. Sargent had a wide national acquaintanceship. Born at Troy, N. Y., in 1849, he moved to St. Paul in 1871 where he organized the De Cou, Corliss & Sargent Co. He later met C. W. Le Valley who later founded the Chain Belt Co. This meeting was the beginning of a long business association for in 1900 Mr. Sargent went to Milwaukee to become secretary and later a director of the Chain Belt Co. He was also a director of the Federal Malleable Co., West Allis, Wis. His father was one of the founders of the Terre Haute, Alton and St. Louis Railroad.

Service to Producers

The Duluth Crushed Stone Co., 1506 Alworth Building, Duluth, Minn., has for sale a 48-in. Symons disc crusher.

The Central Oolitic Stone Co., Bloomington, Ind., has for sale a 10x12 G-SB, single belt-driven air compressor, for $600.

The Silicon Products Co., Ridgeway, Pa., have for sale 1 Ingersoll Trypod drill, practically new, and 1 Armstrong non-traction well drill that has never been used.

C. C. Beam, Melvin, Ohio, has for sale a 40-hp. locomotive type boiler, good for 116-lb. pressure, an 8x14 automatic steam engine and an 8x10 slide valve.

The Carbola Chemical Co., Natural Bridge, N. Y., wishes to sell a high side, 5-roller Raymond mill, complete with dust collector and tubes.

William E. Arens, superintendent of the Limestone Products Co., Black Rock, Ark., is open for a position as superintendent of quarry or for heavy rock or dirt work. His specialty is plant installation. The Limestone Products Co. is closed down indefinitely.

H. E. Millard, Annville, Pa., wants to sell 3 tubular boilers, 150 hp.; a 75-hp. engine, 12x12, No. 19385, Ames Iron Works; 2 tandem compound straight line air compressors; steam driven, 1000-ft. capacity; a 30-hp. Terry steam turbine direct-connected to centrifugal pump, and 2 generating sets.

Lebanon Stone Co., Lebanon, Penna., has for sale a 75-hp. side-crank self-contained engine for $300; a 50-hp. center crank Vim engine for $300, both as good as new. Also a new 33-hp. upright boiler for $450; a 9x14 saddle tank Porter locomotive, 36-in. gage, Class "BS" for $450; a ¾-yd. Marion-Osgood steam shovel for $2,500; a 15-hp. Huber boiler on wheels for $75; and several Worthington steam pumps, 8-in. suction, 6-in. discharge.

The Cerulean Stone Co., Cerulean, Trigg County, Ky., has for sale a No. 3 Champion jaw crusher, 7½x13 in. receiving opening rated capacity 8 to 12 tons per hour, first-class condition; also a No. 2 O'Laughlin screen with the following sections 2 G sections, 24 in. by 9 ft., 2½ and 3 in. perforations; 3 H sections 32 in by 6 ft., 6 in., 1¼, 1½ and 1¾ in. perforations; 2 K sections 36 in. by 6 ft., ⅝ and ¾ in. perforations; 2 L sections, 44 in. by 5 ft. 6 in., ¼ in. perforation, ¼ in. mesh; also a No. 5 Gates elevator, 50 ft. centers, a 3-in. McKiernan tripod drill and 11 1-yd. end-dump wooden quarry cars, 30-in. gage. All in good condition.

Classified Advertising

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

PLANT FOR SALE

Will sell all, controlling, or part interest in new rock crushing plant built in 1920 with capacity of 3000 tons per day. Incorporated for $240,000.00. Plant and all machinery in A-1 condition and ready to function. Locomotives, steam shovels, drills, tracks and everything necessary for successful operation in first-class condition. Certified Public Accountant's report shows profit of more than $28,000.00 made May to December. Needs experienced management. Plant situated in North Central Texas. Not needing superintendent or hired manager. If you are in position to make substantial investment and assume management and control write to

Box 1539, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

CONNECTION WANTED

Young man with college education, business and engineering training and ability, and several years' experience as executive of stone company which he helped to organize and develop, and of which he is now a member, desires an association with the quarry industry, preferably with a small, growing concern in which some capital could be invested. Address

Box 1540, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

WANTED

Job as superintendent or manager of quarry. Have been in the rock business all my life. Can bring crew of the best quarry men in the country. If you want results let me hear from you.

W. J. Briggle, 222 N. Seigeaut Ave., Joplin, Mo.

TEXAS QUARRY FOR SALE

1000-ton rock crushing plant with well developed quarry; inexhaustible supply of highest quality stone; excellent railroad facilities; well established crushed stone market, besides an advantageous ballast arrangement. A bargain with a future: Texas will spend increasing millions annually on its roads.

Box 1541, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

EXECUTIVE MANAGER

Wishes to correspond with a progressive lime or crushed stone concern with the view of investing in company. Forty years of age. Eighteen years' experience as superintendent in lime, crushed stone and ground stone production. Do not want simply a job and will consider only something with a future. Address

Box 1542, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

SUPERINTENDENT

with over 15 years' experience in the construction, operation and maintenance of stone crushing and screening plants, also in the operation and maintenance of steam shovels, locomotives, drills and other modern equipment used in quarrying and excavation work, is now open for position. References furnished. Address

Box 1529, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Shovelman for a ¾-yard shovel, in a stone quarry, Western Pennsylvania. Married man to locate and work year round, either on shovel or general repairs. Give experience, reference and wages expected. Address

Box 1537, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

WANTED

Partner with not less than ten thousand dollars, purchase interest modern limestone quarry and plant, established ten years, well located, excellent territory, demand for product exceptionally good, want to expand and also to go into the sand business. Address

Box 1543, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

FOR SALE

2—8x110′ Rotary Kilns.
6—5x6x7x110′ Rotary Kilns.
3—6x16′ Tube Mills, Silax Lining.
9—5x21′ Tube Mills, Steel Lining.
6—250-Hp. Oil City Water Tube Boilers.
2—No. 5 Gyratory Crushers.
8—Krupp Ball Mills.
1—No. 8 Austin Crusher.
4—Engines, 200 to 500 Hp.

Shafting, Pulleys, Bearings and Elevator Equipment, all first-class operationg condition.

Fifty Acres of Land and Five Buildings, Stone and Steel Construction.

ENGINEERING SALES COMPANY, Nashville, Tenn. W. L. KAISER, Stockertown, Pa.

FOR SALE

1—Oshkosh Concrete Mixer	$ 300.00
4—Tripod Steam Rock Drills	75.00
1—Swing Hammer Pulverizer, with extra hammers	400.00
1—Sturtevant Rock Emery Mill	350.00
1—Gallon Car Unloader, 18-ton bin	350.00
1—Corrugated Crusher Head for No. 5K Crusher, almost new	75.00
1—Smooth Crusher Head for No. 6K Gates Crusher, brand new	175.00
1—Revolving Screen, 30″ diam., 12′ long	200.00
1—Dipper for Marion Model 60 Steam Shovel, 2 ½-yd., new	1000.00
1—Lot 2″ Black Pipe, about 2500 ft.	
1—Worthington Duplex Steam Pump, 12″ suction, 10″ discharge, with brand new steam cylinders	600.00
1—Morris Centrifugal pump, direct connected to steam engine, 10″ suc., 8″ dis.	450.00
1—Worthington Duplex Pump, 4″ suction, 3″ discharge	100.00
1—Dean Bros. Duplex Boiler Feed Pump, 2″ suction, 1 ½″ discharge	75.00
100 ft. 30″ 8-ply stitched canvas belt. Good as new	175.00

All of this equipment is in very good condition; some is almost new. If interested in any of the above items we would be pleased to hear from you.

BIG FOUR STONE CO., Ingalls, Ind.

FOR SALE

1—42-ton Standard gauge Baldwin Mogul, 160-lb. Steam.
1—36-ton Standard gauge Baldwin Mogul, 11′ wheel base.
2—50-ton Standard gauge Brooks 6-wheel switchers, 160-lb. steam.
1—50-ton Standard gauge Shay geared locomotive.
1—42-ton Standard gauge Shay geared locomotive.
2—23-ton brand new 36″ gauge Porter 6-wheel switchers, separate tenders.
2—18-ton O & S 8-wheel two-line locomotive cranes.
1—14-B Bucyrus Steam Shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

FOR SALE

One—Williams Pulverizer, 26″ dia. by 16″ wide	$600.00
One—No. 2 Williams Rock Crusher, 30″ dia. by 20″, good as new	800.00
One—No. 3 Austin Gyratory Crusher, latest type, practically new	800.00
One—24″ Jeffrey Single Roll Coal Crusher	600.00
One—General Electric Motor, 35 H. P., 40 degree, 1140 R. P. M.	175.00
One—Allis Chalmers, 15 H. P. Motor, A. C., 220-440 volt, 1800 R. P. M.	100.00

The above equipment guaranteed to be in excellent condition and will place same on board cars F. O. B. St. Louis. Let us know your requirements. We can save you money.

Morse Engineering Company
Chemical Building St. Louis, Missouri

New Rubber Belting

300 ft. 12″ 6-ply	$0.99 per ft.
423 ft. 14″ 5-ply	1.04 per ft.
527 ft. 14″ 6-ply	1.25 per ft.
529 ft. 16″ 6-ply	1.39 per ft.
520 ft. 16″ 8-ply	1.90 per ft.
150 ft. 18″ 6-ply	1.48 per ft.
512 ft. 18″ 8-ply	2.00 per ft.

Rolls cut to any length.

The National Belting & Salvage Co.
268 East Water Street, Milwaukee, Wis.

Complete Quarry Equipment

to those contemplating new construction or additions to quarry equipment for the season of 1922.

As a result of alterations in plant equipment, and discontinuing of one operation, a large operator in the stone crushing field has for sale a complete line of high class used equipment, consisting of crushers, elevators, screens, compressors, steam shovels, locomotives and cars and other miscellaneous equipment.

This equipment is in A-1 condition, and should be sold direct to users. If in the market, address

Box 1522, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

FOR SALE

1—No. 5 Austin Crusher, Direct Drive.
1—Three-Roll Bradley Pulverizer.
1—Three-yard Dirt Dipper, with reversible manganese points for 70 or 70 C Bucyrus Shovel.

This equipment is in A-1 operating condition and should be sold direct to users.

Box 1534, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

FOR SALE

10 x 14 in. Vulcan, 12-ton dinkey, 36-in. gauge.
Marion dragline excavator, 50-ft. boom, Shop No. 4058.
Williams swing hammer pulverizer, No. D-43.
20—3-yd. side dump, 36-in. gauge Oliver tram cars.
2—American Process dryers, 24 ft. long by 48 in. diam., sprocket driven.
125 H.P., 16 x 24 in. steam engine.
Worthington steam pump, 10-in. intake, 8-in. discharge, 20-in. cylinders—Shop No. 16876.

E. W. COOPER, Engineer
174 Third Avenue, North Nashville, Tenn.

WANTED

40-ton, 4-wheel Saddle Tank Locomotive, Standard Gauge.

CONSUMERS COMPANY
Conway Building Chicago, Ill.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1¼ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

WANTED

Parts for No. 8 McCulley Gyratory Crusher and No. 5 Gates Style "D" Gyratory Crusher.

RAMPUS STONE CO.
Strawberry Plains Tennessee

FOR SALE

1—Vulcan, 9-ton, 24″ ga. locomotive.
20—Koppel all steel dump cars, 24″ ga.
1—mile of track, 20-lb. rail.
1—Ft. Wayne jaw crusher, No. 9, with elevator, screens and bins.

Get our prices on heavy equipment
LEONARD F. SMITH & CO.
604 Citizens National Bank Building
South Bend, Indiana

FOR SALE

2000′—16-lb. Track, 30″ gauge.
12—1-yd. U Dump Cars, 30″ gauge.
5—Turntables.
6—End Dump Quarry Cars.
2—Gable Side Dump Cars.
New and Relay Rails.

IVANHOE EQUIPMENT CO.
1130 Ivanhoe Road Cleveland, Ohio

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

RETURN TUBULAR LOCOMOTIVE **BOILERS** WATER TUBE SCOTCH MARINE

A LARGE STOCK OF HIGH-GRADE BOILERS OF PRACTICALLY ALL SIZES, TYPES AND MAKES, TAKEN OVER FROM DU PONT CHEMICAL COMPANY'S AND OTHER PLANTS WITH PRODUCTION RECORDS—RECONDITIONED, OFFERED SUBJECT TO ANY INSPECTION, AVAILABLE *NOW!*

"SAVE TIME AND MONEY ON YOUR POWER INSTALLATION—LET DAVIS FURNISH THE BOILERS"

LONG DISTANCE TELEPHONE RANDOLPH 2232

J. F. DAVIS

1122-1123-1124 Harris Trust Building CHICAGO, ILL.

EQUIPMENT FOR SALE

BOILERS

1—250-H.P. Sterling.
1—300-H.P. B. & W.
2—72"x18' H. F. T. Boilers.

ENGINES

1—24x48 Corliss.
1—18x30 Side Crank Buckeye.
1— 6x 6 Vertical.
1— 6-H.P. Fairbanks and Morse Gasoline.
1—10-H.P. Fairbanks and Morse Gasoline.

WATER HEATERS

1—30 in. x 8 ft. Pittsburg.
1—33 in. x 7 ft. 6 in. Hoppes.
1—30 in. x 7 ft. 6 in. Morrison.

WATER PUMPS

1—5x9x12½x10 in. Compound Duplex Worthington.
1—7x4½x8 Pulling.

STACKS

1—48 in. x 80 ft.

RAIL EQUIPMENT

8—36 in. gauge end dump Quarry Cars.

CRUSHERS

1—30 in. Jeffrey Swinging Hammer Pulverizer.
1—12"x20' Screw Conveyor.

DREDGE MACHINERY

1—Set Dipper Dredge Machinery, 1½ yard Dipper, complete.

THE OHIO GRAVEL BALLAST CO.
2103 Union Central Bldg. Cincinnati, Ohio

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3" 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 36" and 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 3 roll and No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

REBUILT MACHINERY

8—Jaw Crushers, 6x10 to 15x24.
1—Gates Gyratory Crusher, No. 8.
12—Sets Geared Crushing Rolls.
4—Williams' Crushers and Pulverizers.
1—No. 48 American Ring Pulverizer.
1—54"x13" Hardinge Pebble Mill.
1—Braun's Laboratory Pulverizer.
20—Air Compressors, Steam and Belt Driven, 17 to 3000 ft. capacity.
30—Rock Drills, Steam and Air, with Tripods or Column Bars.
1—No. 5 Temple Ingersoll Electric Air Drill, complete.
20—Vertical Steam Boilers, 6 to 45 Hp.
24—Horiz. Steam Boilers, 35 to 180 Hp.
12—Feed Water Heaters, 50 to 300 Hp.
24—Steam Engines, 4 to 500 Hp.
30—Oil, Gas and Gasoline Engines, 2 to 800 Hp.
1—1200 K. W. ELECTRIC POWER PLANT, complete.
2—Garden City Fans, 110".
1—Sirocco Blower, No. 7.
12—Friction Clutches, 12" to 42".
20—Steam Hoisting Engines.
1—40-Hp. Gasoline Hoisting Engine.
25—Centrifugal Pumps, 3" to 10" discharge.
25—Steam Pumps, 1" to 7" discharge.
1—Triplex Pump, 10x10.
1—Set R. R. Track Scales, New.
1—Oil Storage Tank, Horizontal, 9000 Gal. Cap.

Also the "Clean-up" of the Altoona Cement Plant, North Altoona, Kansas, a bargain lot of Crushing, Pulverizing, Elevating and Conveying Equipment, Steel Buildings, Steel Storage Bins, etc.

The Machinery & Supply Corp.
Joplin, Missouri

60 x 84 TRAYLOR JAW

crusher, placed on foundations, but never put in service.
2—24"x36" type 15-B Farrell crushers.
2—24"x36" type 14-B Farrell crushers.
1—18"x24" Farrell jaw crusher.
1—16"x32" Acme jaw crusher.
1—12"x24" Reliance jaw crusher.
1—11"x20" Acme jaw crusher.
1—9"x16" Reliance jaw crusher.
1—7½"x13" Champion jaw crusher.

We can also offer other jaw crushers, gyratory crushers, elevators, screens, and general quarry equipment.

READING ENGINEERING CO., INC.
1227-A Tribune Bldg. New York, N. Y.

FOR RENT AND SALE

13—6-yd. re-built dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, used 8 mos.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, used six months.
1—Marion 76 steam shovel, No. 3503, std. gauge.
1—P. & H. gasoline drag-line and crane, caterpillars, 40' boom, ½-yd. bucket, new 1921.
1—Northwest gasoline drag-line and crane, caterpillars, 40' boom, ½-yd. bucket, new 1921.
1—No. 2 Brown-Hoist four-wheel gasoline crane, std. ga., 40' boom, ½-yd. bucket, new 1921.

LOCOMOTIVES

1—40-ton 17x24 in. four-wheel switcher.
2—NEW 25-ton six-wheel Porters, separate tenders, 36 in. gauge.
2—18, 14, and 10-ton Vulcans, 36 in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

IMMEDIATE DELIVERY

Send Us Your Steam Shovel Inquiries

No. 18 K GATES CRUSHER.
50—75-Hp. Single Drum Hoists, 25 Cy. Motors.
25—40-50 Hp. Double Drum Hoists, 60 Cy. Motors.
Nos. 3-5-6-7½ and 8 K CRUSHERS.
2-6- and 12-ton Gasoline Locomotives.
10x12 in. Steam Hoist, 3-Drum with Boiler.
60-Hp. Locomotive Type Boiler.
150-Hp. Boiler, Buttstrap with Stoker 156 lbs.
25—50-100 Kw. and larger Turbo and Eng. Sets.
50—5000 ft. Steam, Belt and Electric Drive Comp's.
10—15- and 20-ton Locomotive Cranes.
Large amount Contractors' Equip., Towers, Derricks, etc.

Send us your inquiries for Steam Engines, Centrifugal Pumps, Quarry Equipment, etc.

ROSS POWER EQUIP. CO.
Indianapolis, Ind.

Buyers' Bulletin

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

Wm. P. Messinger, 813 Woodland Ave., Millville, N. J., is interested in receiving catalogs of the following equipment: bags, bins and bin gates, car pullers, conveying equipment, washing equipment, screens, sand pumps, sand washing boxes, car loaders, dump bodies and hand shovels.

Northwest Gypsum Products Co., 515 Montana Bldg., Lewistown, Mont., want full data in regard to equipping a plaster mill. Also want catalogs and prices on the following: air compressors, conveyor and transmission belting, blast hole drills, bins and bin gates, buckets, portable buildings, calcining machinery, clutches, crushers, sand and stone dryers, frogs and switches, gear speed reducers, water, air drill and pneumatic tool hose, electric locomotives, motors, pulverizers, sheaves, welding equipment, wire rope and pyrometers.

Maryland Mineral Co., Texas, Md., write us as follows: "We are in the market to purchase a tap screen; two screen decks for making three sizes of materials desired."

John T. Woodruff, Woodruff Bldg., Springfield, Mo., wants prices and catalogs on sand-lime brick machinery.

Franklin Limestone Co., Nashville, Tenn., are in the market for a dust collecting system.

Granite Rock Co., Box M, Watsonville, Calif., write as follows: "We desire prices and specifications of locomotive crane for loading crushed rock from piles to cars and vice versa, 50-60 ft. boom, 40 c. f. bucket."

National Concrete Materials Co., J. R. Rankin, Gen. Supt. of Plants, Luverne, Minn., writes us for catalogs and prices on crushers, gravel pumps, pipe for gravel pump, sand and gravel screens, chain elevators and drum hoists.

Samuel Ellis, 10 S. Derby Ave., Atlantic City, N. J., wants catalogs on concrete products machinery.

James L. Morse, Colorado School of Mines, 1114 Illinois St., Golden, Colo., wants catalogs on the following equipment: electric and oxy-acetylene welding equipment, steam shovels, sand pumps, industrial railways, gasoline locomotives, power transmitting equipment, pulleys, centrifugal, electric, steam and gasoline pumps, hoists and hoisting engines, oil and gasoline engines, cranes, clutches and crushers.

E. C. Blanc, Engineer, 35 Chemin de Plaisance, Toulon (Var), France, wants catalogs on lime hydrators, screens and bagging machinery.

Lufkin Rock Co., Inc., Lufkin, Texas, want to purchase a gyratory crusher and steel rail.

Littleton Stone Products Co., Wheeling, W. Va., write us as follows: "We are starting a stone crushing and stone sawing business at Littleton, having taken over the marketing of a large quantity of sandstone blocks which are already quarried. We are in the market for a crushing plant, semi-portable type with up to 500 tons capacity daily, together with elevators, screens, and bins. Also, a stone planing and sawing outfit, suitable for getting out small building blocks, trim, etc., but also adapted to getting out large blocks for bridge masonry."

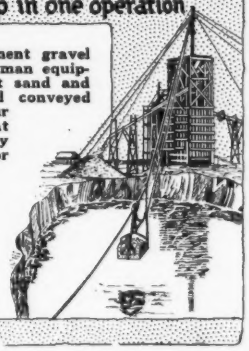
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

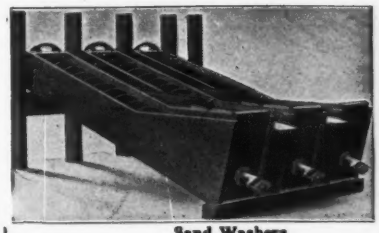
dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago
Also Mfrs. of Power Scrapers





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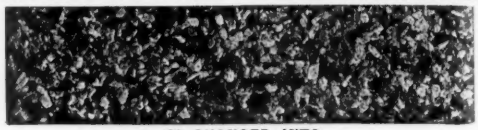

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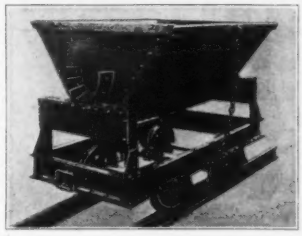

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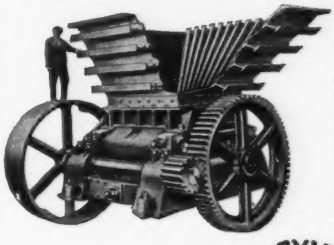

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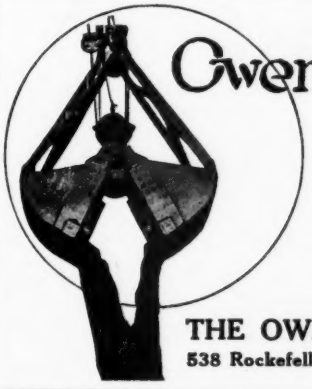

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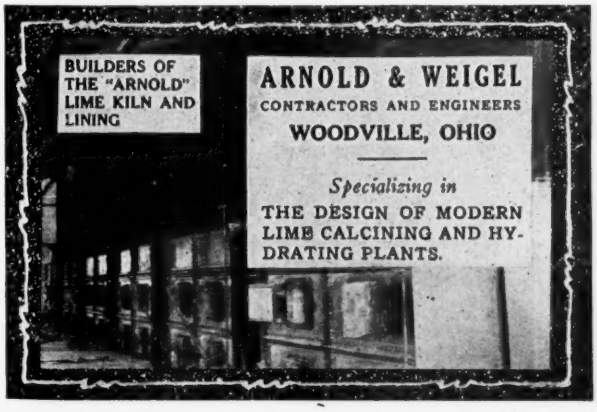
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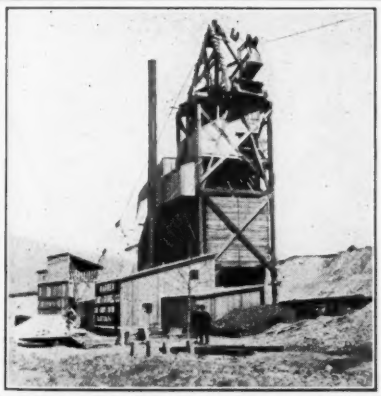

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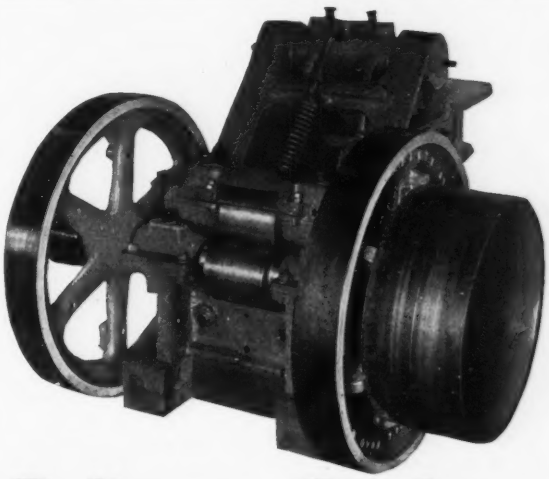

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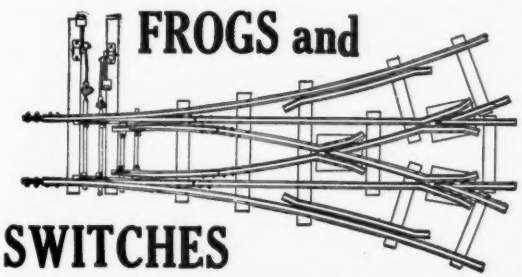

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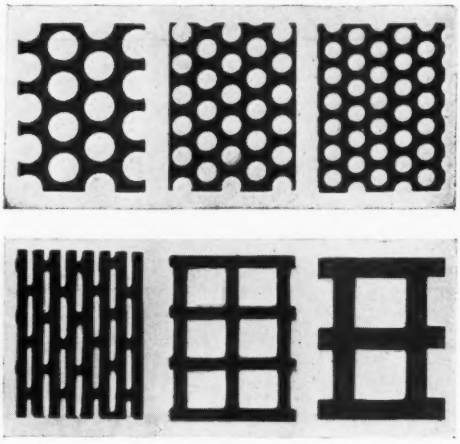

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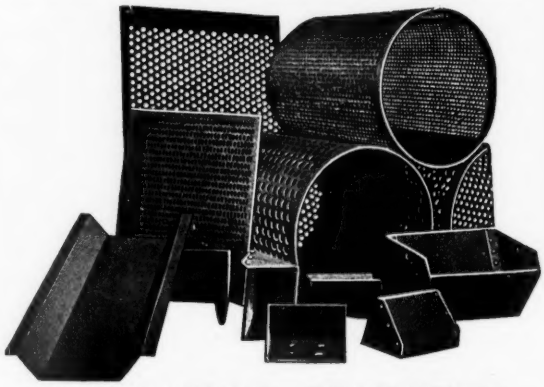

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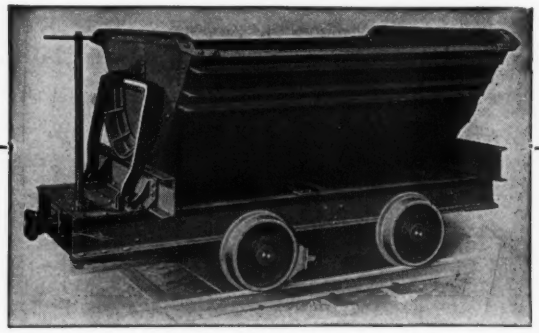

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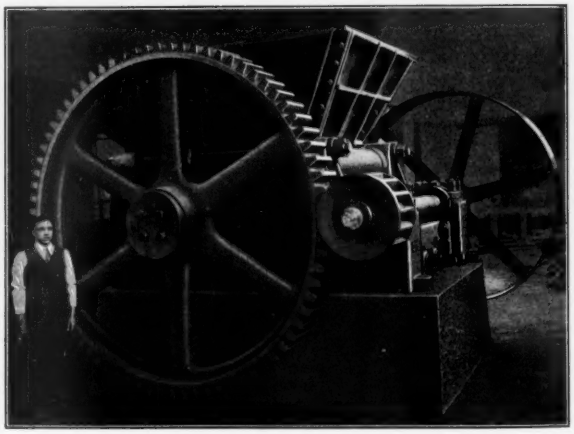

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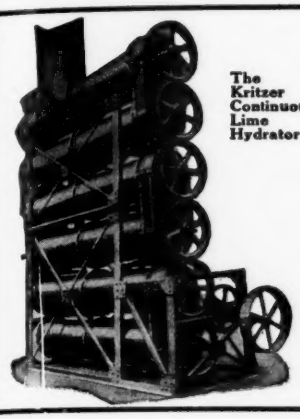

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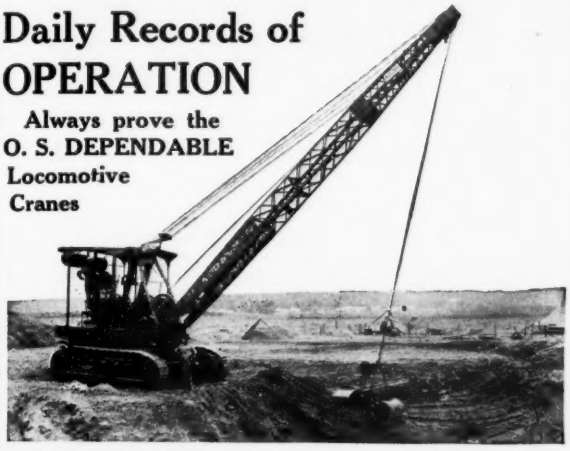

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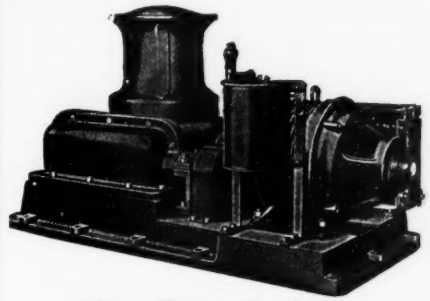

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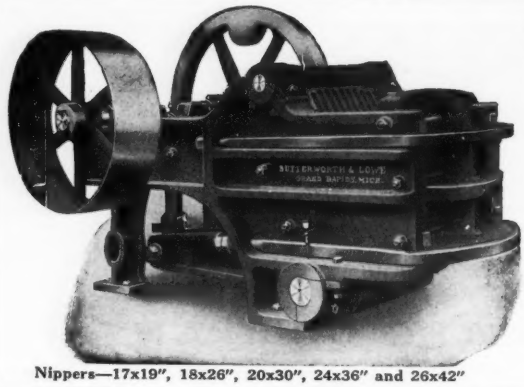

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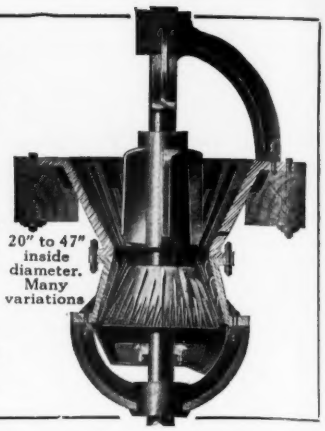

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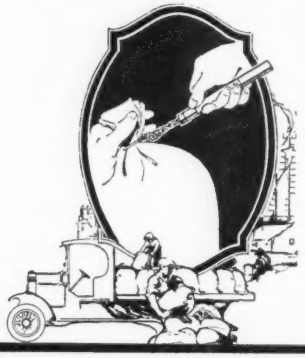

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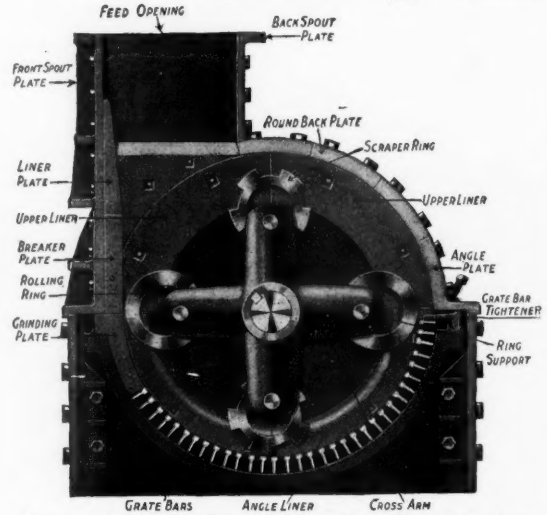

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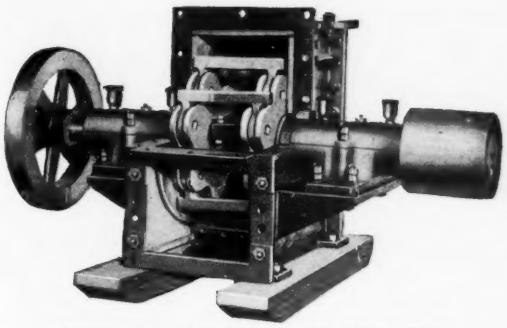

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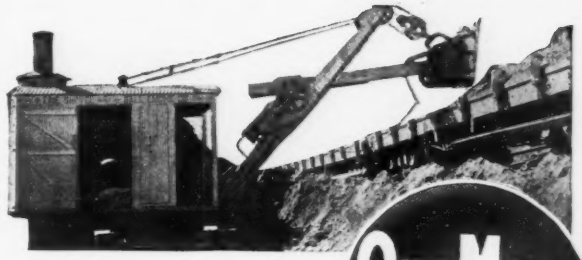

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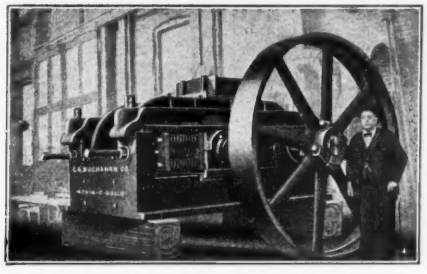
BUCHANAN CRUSHING ROLLS



Type "C" Buchanan Box Bed Crushing Rolls for Heavy Duty Bulletin No. 13

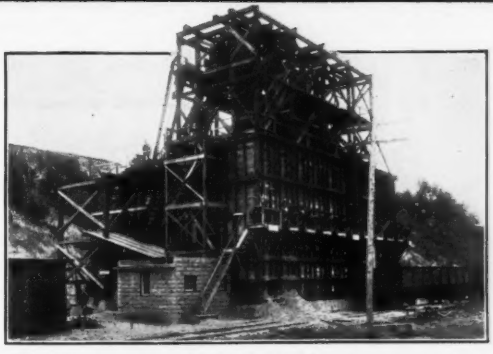
Years of manufacturing experience, combined with an intimate knowledge of the conditions under which such machines operate, assures the purchaser of Buchanan Equipment machines of remarkable durability.

COMPLETE CRUSHING PLANTS

C. G. BUCHANAN CO., Inc.

Cedar and West Streets **NEW YORK CITY**

Clean Sand



This plant produces CLEAN SAND. The dependable

G-R-M SAND SETTLING TANK

does the work. The sand is WASHED AND DRAINED

Fine sand may be rejected at will by the use of the adjustable overflow

No matter how dirty the sand, the G-R-M Sand Settling Tank will clean it. It churns up the sand, loosens the dirt, and floats the foreign matter off at one end, while the clean sand is taken out from the other end.

SEND FOR INFORMATION—USE THE COUPON

GOOD ROADS MACHINERY Co. 1203 Tower Bldg., Chicago

Good Roads Machinery Co., 1203 Tower Bldg., Chicago, Ill.
Gentlemen: You may send me additional information concerning the G-R-M Sand Settling Tank.

Name_____

Address_____

We are now washing_____tons of sand per day.

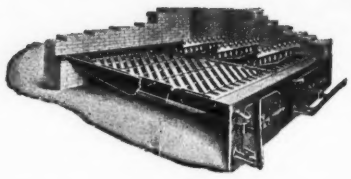
PERFORATED STEEL SCREENS

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge, and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pennsylvania



McGINTY GRATES

McGinty Grates glorify economy. They present the ultimate in Grate construction. They have all that a good grate should have —rugged construction, enabling it to withstand a higher degree of heat without warping than any other grate on the market.

The McGinty is a shaking, sifting and dumping grate, and the fires can be cleaned with closed doors.

Send for descriptive matter and prices.

The Kramer Bros. Foundry Co.
Dayton, Ohio

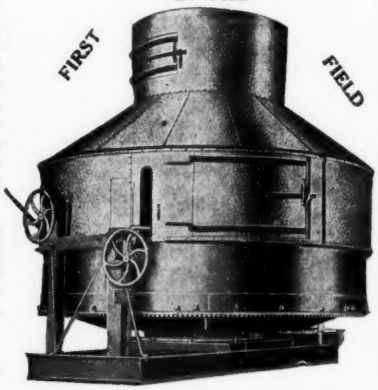
The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

IN THE FIRST FIELD



Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

Send for Catalog

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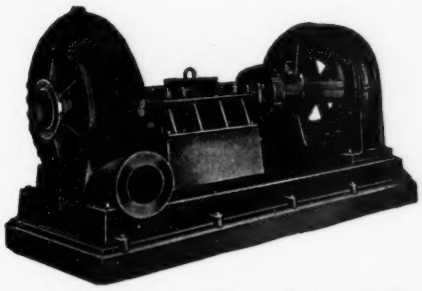
Patentee and Sole Manufacturer
DULUTH - - MINNESOTA

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

Crushing, Grinding, Pulverizing,
Screening, Sizing, Air Separating, Mixing,
Weighing, Elevating and Conveying Machinery
Complete Units -:- -:- Engineering Service

STURTEVANT MILL CO., HARRISON SQUARE BOSTON, MASS.



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4" up, arranged for belt, motor, or engine drive.

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Baldwinsville, N. Y.

39 Cortlandt Street, New York City
Real Estate Trust Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

Morris

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

METRO NITE

for Stucco-

Stucco Buildings, Concrete Blocks or Bricks faced with Metro-Nite are beautiful, artistic and everlasting.

Metro-Nite White is of a crystalline character, really a siliceous dolomite. It is extremely hard, sharp and cleanly graded, making a bright, sparkling face.

Free samples mailed on request.

Two colors—White and Green.

The Metro-Nite Co.
333 Hartford Ave., Milwaukee, Wis.

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The AMERICAN GASOLINE LOCOMOTIVE

Evans Quarry, Marion, Ohio
"More than satisfied."—DAN EVANS

Two great Americans have made substantial records at Marion, Ohio. President Harding made good in Marion, his home town, and the American Gasoline Locomotive has made a fine record in the John Evans Lime & Stone Co., located in Marion, Ohio.

Here you will find the American conspicuous for its dogged day-in and day-out service on the routine daily, noticeably free from the small defects and troubles that frequently halt the operation of the ordinary locomotive.

The Hadfield-Penfield Steel Co.
Bucyrus, Ohio

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TRANSMISSION MACHINERY

Dust Proof Friction Clutches—

The continuous friction surfaces of the Plamondon Disc Type Friction Clutch, consists of but three parts, with all the simple mechanism for adjusting and operating on the outside in plain view.

No part is affected by centrifugal action—they can be run at high speed with safety, and without loss of efficiency. The adjustment for wear is made entirely by means of one adjusting collar, which gives a uniform pressure on all parts of the friction surfaces. These surfaces are absolutely dust proof, and are universally used by leading cement mills.

Our products also consist of Heavy Gearing, Cut Gears and Machine Molded Gears of all kinds—Shafting, Pulleys, Hangers, Couplings, Collars, Pillow Blocks, Worm-Wheels, Fly-Wheels, Rope Sheaves, Grey Iron and Semisteel Castings by analysis.

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Engineers, Founders, and Machinists
Established 1859 — Incorporated 1877
Works and Main Office: 5301 South Western Boulevard, Chicago, Illinois
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Many of the leading concerns have found the solution to their fine grinding problems on Gypsum, Cement, Talc and Soapstone, Graphite, Limestone and similar materials by installing

MUNSON
Under Runner Buhr Mills

There is practically no limit to the degree of fineness to which these mills will grind these products. They will do the work economically and satisfactorily in every way. Solid in construction—will do away with delays and shut-down and keep out of the repair shop. Their Automatic Adjustment, Rapid Grinding and Perfect Balance Insure good results and fine and uniform grinding.

Why not investigate? Send for our new catalog, number 71.

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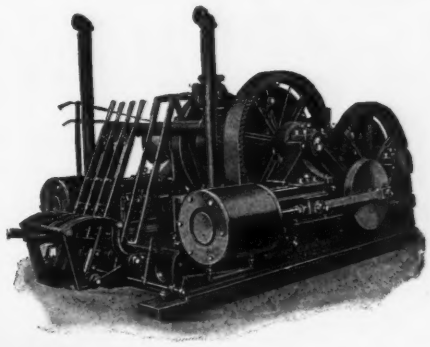
Mill Machinery Co., Inc.
Utica, New York

Thomas Hoists

Steam and Electric
Single and Two Speed Types



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Drag Scrapers
Derricks
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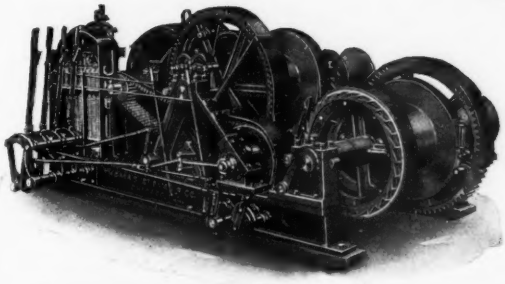
Car Haulage



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Andrew Carnegie Never Hesitated!

ANDREW CARNEGIE never hesitated to scrap a plant or process when he found a more profitable method.

There was no inclination to cling to old equipment if he had a proven means of increasing profits—"increased tonnage or better quality" were his watch words.

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The HUM-MER process of screening has saved the Bethlehem Steel Co. thousands of dollars preparing coal for their coke ovens.

Let us show you how you can save money and earn greater profits with the HUM-MER.

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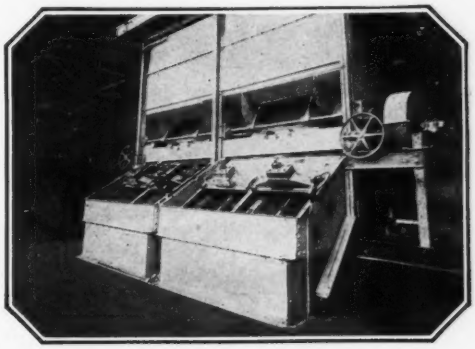
Cleveland, Ohio

Manufacturers of Woven Wire Screen and Screening Equipment



Screening Ore with HUM-MER *Electric* Screens

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Interstate Equip. Co., New York, N. Y.

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Bates Valve Bag Co., Chicago, Ill.
Jaite Co., The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BARRELS—Lime
Draper Mfg. Co., The, Cleveland, Ohio.
International Cooperage Co., Niagara Falls, N. Y.
Sandusky Cooperage & Lbr. Co., Toledo, Ohio.

BELTING
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
New York Belting & Packing Co., New York, N. Y.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bacon, Earle C., Inc., New York City.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.

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Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

BRICK MACHINERY
Besser Sales Co., Chicago, Ill.
Shope Brick Co., Portland, Ore.

BUCKETS—Elevator
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Orton & Steinbrenner, Chicago, Ill.

BUCKETS
Blaw-Knox Co., Pittsburgh, Pa.
Browning Co., Cleveland, Ohio.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.
Williams Co., G. H., Erie, Pa.

CABLEWAYS
Blaw-Knox Co., Pittsburgh, Pa.
S. Flory Mfg. Co., Bangor, Pa.
Interstate Equip. Co., New York, N. Y.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Gehret Bros., Bridgeport, Pa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

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Kennedy-Van Saun Mfg. & Eng. Corp., N. Y. City.

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Ingersoll-Rand Co., N. Y. City.

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Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

CRANES—Locomotive Gantry
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

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American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York, N. Y.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Gruendler Pat. Crusher Co., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DERRICKS
Terry Mfg. Co., New York, N. Y.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DRILLS
The Loomis Machine Co., Tiffin, Ohio.
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
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Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
General Explosives Co., Chicago, Ill.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

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Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
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Artingstall, S. G., Jr., Chicago, Ill.
Austin Co., The, Cleveland, Ohio.
Bacon, Earle C., Inc., New York, N. Y.
Buckbee Co., J. C., Chicago, Ill.
Federal Bridge & Structural Steel Co., Waukesha, Wis.
Fuller Engineering Co., Allentown, Pa.
James N. Hatch, Chicago, Ill.
R. W. Hunt & Co., Chicago, Ill.
Randolph-Perkins Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Ball Engine Co., Erie, Pa.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

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Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

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GAS PRODUCERS
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Plamondon Mfg. Co., Chicago, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

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GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
Flory Mfg. Co., S., Bangor, Pa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

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Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

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LIME KILNS
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Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Vulcan Iron Works, Wilkes-Barre, Pa.

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Ball Engine Co., Erie, Pa.
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Jeffrey Mfg. Co., The, Columbus, Ohio.
Orton & Steinbrenner, Chicago, Ill.

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Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

(Continued on page 64)

"A WILLING WORKER"

It is sometimes difficult to get the first olive out of the bottle, but after you get the first one the rest comes easy.

It's the same in selling Type "J" Locomotive Cranes. Sell one Type "J" and repeat orders follow.

WHY?

Because it is a regular "honest to goodness" crane, big by comparison, both in size and service.

It is human nature to like a willing worker, one that does a full day's work, day after day, without interruption or without coaxing.

Try out the type "J" and its operation will speak more convincingly than anything that can be said of its merits.

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Cleveland, Ohio LC-108

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May we send you our latest catalog?

With Shay Geared Locomotives you can get rock out of almost inaccessible places.

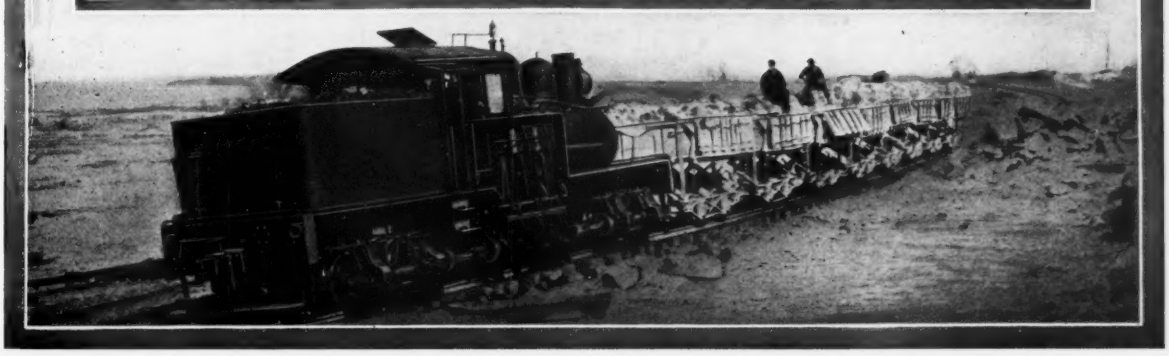
A flexible driving shaft which compensates for sharp curves, small gear-driven wheels—even those of the tender being connected to the driving shaft, and a powerful, grade-climbing engine, make hard-to-get-at spots easy for a Shay.

You can operate a Shay where you couldn't use a rod engine.

Greater production and lower cost operation are secured with Shay Geared Locomotives.

LIMA LOCOMOTIVE WORKS, Incorporated

Lima, Ohio **17 East 42nd St., New York**



Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

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MOTOR TRUCKS
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PACKING—Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber & Mfg. Co., Cincinnati, Ohio.
N. Y. Belting & Packing Co., New York, N. Y.

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Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PIPE JOINTS
Berry Flexible Pipe Joint Co., Philadelphia, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

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Stephens-Adamson Mfg. Co., Aurora, Ill.

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Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

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Traylor Eng. & Mfg. Co., Allentown, Pa.

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Universal Road Mach. Co., Kingston, N. Y.

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Leschen, A., & Sons Co., St. Louis, Mo.

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Universal Road Mach. Co., Kingston, N. Y.
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SHEAVES
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Bucyrus Co., South Milwaukee, Wis.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SHOVEL REPAIRS—Steam and Electric
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STEEL PLATE CONSTRUCTION
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Greenstone Products Co., Roanoke, Va.
The Metro-Nite Co., Milwaukee, Wis.

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Easton Car & Constr. Co., Easton, Pa.

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Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
The Stacey Bros. Gas Constr. Co., Cincinnati, Ohio.

TESTING SIEVES AND TESTING SIEVE SHAKERS
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TRAMWAYS
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Link Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WELDING EQUIPMENT
Oxweld Acetylene Co., Newark, N. J.

WHEELS, AXLES AND JOURNAL BOXES
Easton Car & Constr. Co., Easton, Pa.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

WIRE CLOTH
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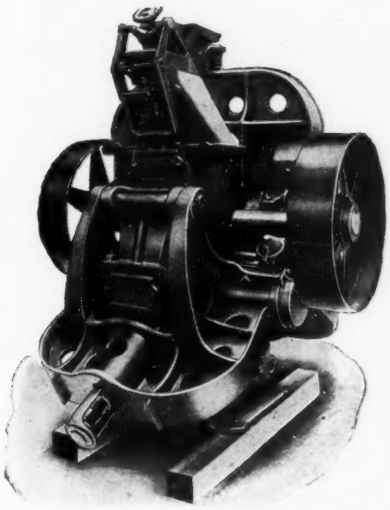

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Preliminary Grinder for Tube Mills

LIMESTONE ..... 20 to 40 Mesh
CEMENT CLINKER ..... 20 to 60 Mesh

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The UNIT that has LARGER OUTPUT with LESS POWER WEAR and ATTENTION than any other.

It will be to the interest of those who operate CEMENT PLANTS to know what the Maxecon Unit will do.

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Kent Mill Company

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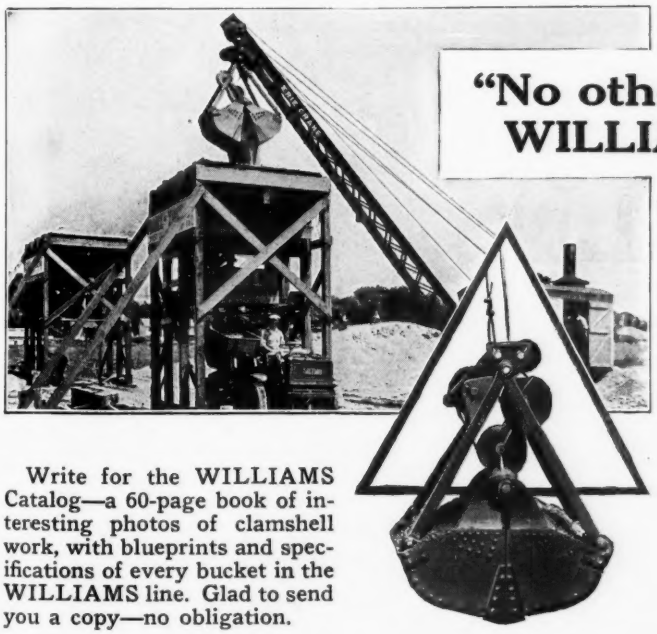


"No other clamshell except the WILLIAMS, lasted a season"

writes Fred. J. Schmidt
Diamond Sand & Gravel Co.

"Our WILLIAMS Clamshell is 3 years old. No other bucket except the WILLIAMS has lasted a season on our work, and we have tried five different makes."—***Fred J. Schmidt, Secy. and Treas., Diamond Sand and Gravel Co., Bedford, Ohio.***

The WILLIAMS "Favorite" is the ideal bucket for all-around general service because—

VERY SPEEDY. Its closing action is quick and powerful, because of the multiplied leverage of the WILLIAMS Closing Arm, WITH THE SHEAVES IN TANDEM—exclusive WILLIAMS design.

It opens instantly, every time, as soon as the closing line is slacked, because of its perfect balance.

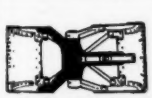
STRONG CONSTRUCTION. For instance, on the WILLIAMS, the hinge bearing has only one moving part, instead of the five found on most clamshells—simpler and stronger design.

The WILLIAMS triangular head construction makes possible a much shorter and stronger head bearing—saves "wobble" and wear at the head pin, and holds the scoops in line—PERMANENTLY.

Both for speed and for strength the WILLIAMS is the clamshell for all-around use. You need a WILLIAMS for maximum profits from your handling equipment.

Write for the WILLIAMS Catalog—a 60-page book of interesting photos of clamshell work, with blueprints and specifications of every bucket in the WILLIAMS line. Glad to send you a copy—no obligation.

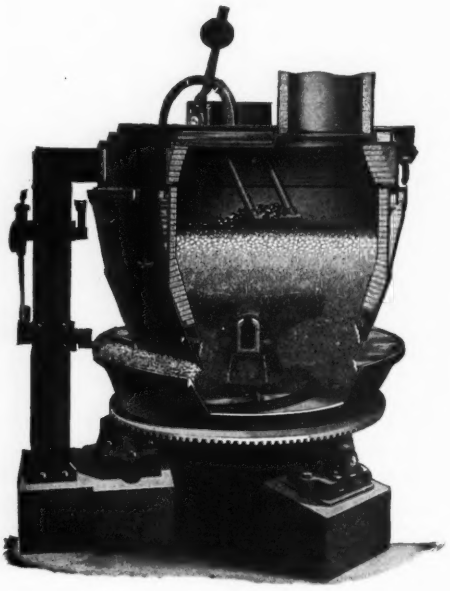
G. H. WILLIAMS CO., Erie, Pa., U. S. A.



This large one-piece hinge bearing takes the place of five moving parts found on most clamshells. It holds the scoops in line—**permanently.** A WILLIAMS never spills part of its load between the scoops, even after years of service.

WILLIAMS
QUICK-ACTING CLAMSHELLS
All Parts Guaranteed Against Breakage

The Machine of Absolute Satisfaction



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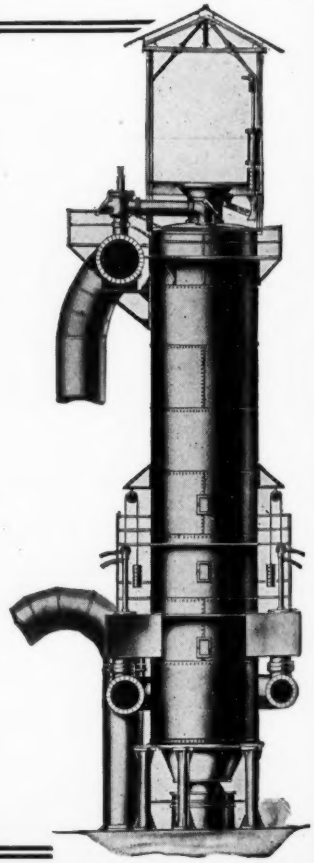

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Lynchburg, Va., U. S. A.
Using the Nationally Famous Virginia Foundry Irons

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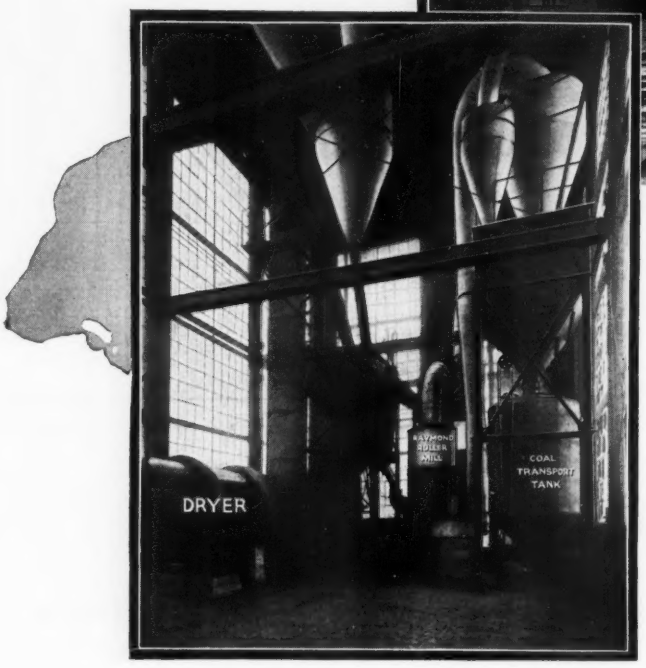

Interior of Powdered Coal Preparation Plant showing Dryer, Raymond Roller Mill with Air-Separation and Powdered Coal Transport Equipment.

More Than Two-thirds of Those Boiler, Copper, Iron and Steel Plants Who Employ Powdered Coal as a Fuel Use Raymond Mills to Do the Grinding

Powdered Coal to be burned properly and efficiently should be uniformly fine, containing no oversize, and be in a fluid or smoothly flowing condition so it can be easily handled by the conveying and burning system without clogging. Raymond Roller Mills equipped with Air Separation produce that kind of powdered coal and at the minimum cost for labor, repairs and power.

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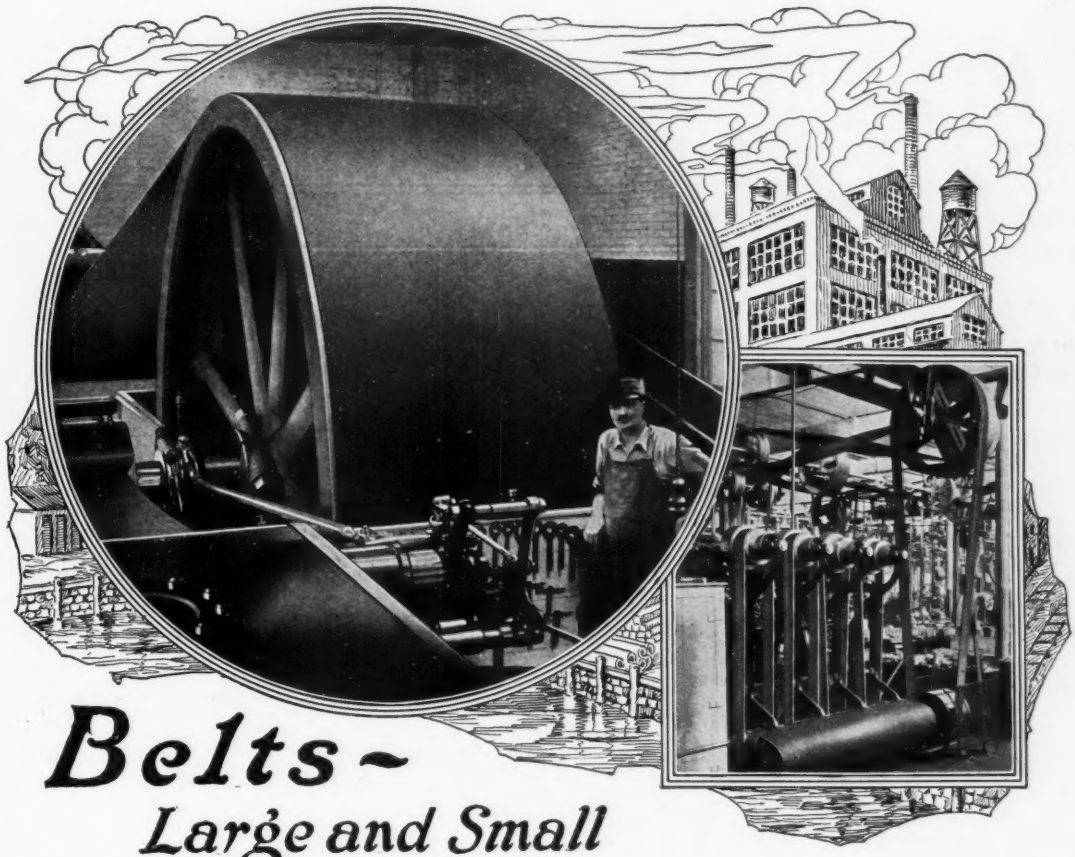

Belts ~ Large and Small

The large belt shown above is on the main drive of Bryant Paper Company, Kalamazoo, Mich. Width, 60 inches—10 ply; Driver Pulley; 16 ft. diameter; Driven Pulley, 8 1/2 ft. diameter; Belt Speed, 3920 ft. per minute; Horse Power, 700.

The insert shows the machine shop of Reo Motor Car Company, Lansing, Mich., equipped throughout with Test Special Rubber Belting.

When you realize how Test Special Rubber Belting is made—the quality and craftsmanship that go into it—it is not surprising that the two installations shown herein are giving such unusual service.

Such endurance in a rubber belt is largely a question of the kind of cotton duck and rubber friction used in its construction, plus skill in manufacture. Weight of duck does not necessarily indicate its adaptability for belting use; it must have strength and flexibility. Only duck having these essentials is used in Test Special, the plies of which are bonded with a rubber friction that not only shows up strong in a sample but retains its adhesiveness under the stress of long, hard service.

These basic elements are combined by skilled artisans to make Test Special Rubber Belting the most durable and economical means of power transmission.

Reap the benefits of this money saving proposition by putting Test Special Rubber Belting to work for you, now.

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Pittsburgh St. Louis Salt Lake City San Francisco

TEST SPECIAL RUBBER BELTING

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